

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

OCT. 24, 1955

50 CENTS

The New American Tradition... Be Prepared

Convair is now producing in quantity the supersonic, delta-wing F-102A.

With this day-or-night, all-weather Interceptor the U.S.A.F. Air Defense Command will *be prepared* to better fulfill its mission — the discouraging of attack through the effective protection of America!

Through **engineering to the Nth power** Convair continues to *be prepared* to help assure peace and freedom by producing aircraft with the capabilities of the F-102A.

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION





New Holley turboprop power control installed in Lockheed R7V-2

Over hundred and six passengers or 36,000 pounds of cargo cruise at speeds up to 450 miles per hour in the Navy's new Lockheed R7V-2 turboprop Super Constellation. Four Pratt & Whitney Aircraft model line T-34 propeller turbine engines develop a total of 22,000 horsepower for take-off. Each of the four is automatically controlled by a new Holley gas turbine power control.

High performance turboprop engines like the T-34 demand

extreme accuracy in fuel metering to maintain their high performance ratings and at the same time control operation within satisfactory limits. Through a system of accurately measuring four separate ratios, the Holley control automatically meters carbureted fuel flow to the engine in accordance with the engine operating requirements.

The Holley gas turbine control is the result of accurate research and development to provide a

light weight, compact means of accurately metering fuel consistent with engine requirements.

This and other Holley developed fuel metering devices have played an important role in our country's undisputed leadership in the design, development and manufacture of superior aircraft.



Leader In The Design, Development, and Manufacture of Aviation Fuel Metering Devices.



Need to save weight and space? Insure reliability? Guarantee fast action? Then consider the talents of pneumatics!

Weight-saving pneumatic systems use smaller lines, require no return lines whatsoever. Even the heart of a pneumatic system — the compressor — aids in the task of conserving weight and space. You store air until it's needed, building up high-horsepower delivery from a lightweight, low-horsepower source!

Pneumatic systems give fast, efficient performance through an extremely broad temperature range. Because the viscosity of the air they use remains essentially the same from -65° to $+350^{\circ}$, pneumatic systems are never sluggish!

Pneumatic systems are dependable — free to serious leakage problem. The compressor itself automatically compensates for any minor leakage which might occur. Furthermore, since the air used in the system cannot burn, pneumatics free you from the danger of fire!

We here at Kidde have a complete line of pneumatic system components, including high-output compressors, as well as the facilities for engineering complete pneumatic systems. If you have a problem in pneumatics, please write us.

Walter Kidde & Company, Inc., 1010 Main Street, Cullerville 9, N. J. • Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

Kidde
FOR
PNEUMATICS



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TOMORROW: Some day soon you may well ascend on what's called the Metro-Port right to your office door. It's all what this machine does for tomorrow.

Maybe you'll emerge from the subway to walk on the Airline... In 1973! Here he's whisked from this city's Metro-Port right to your office door. It's all what this machine does for tomorrow.

If a "new departure" in tomorrow's travel like this does take place, you can be sure that *New Departure* ball bearings will be on the job. Already *New Departure's* Air-Rail Research Program is developing ball bearings for operation at speeds of over 180,000 rpm and temperatures of 500° F, or higher.

New Departure ball bearings are specified today on all forms of transportation because they hold friction to an absolute minimum, support loads from any direction, keep parts in perfect alignment, require little or no upkeep.

If your present-day product calls for future improvements, call on *New Departure*. You'll benefit from nearly 50 years of ball bearing experience.

NEW DEPARTURE • BRANCH OF GENERAL MOTORS • BENTON, CONNECTICUT

NEW DEPARTURE
BALL BEARINGS



MAKING WITH FOR A BALL



TODAY: Also apparently getting into the future, *New Departure* ball bearings play a vital role in keeping modern gyroscopes functioning smoothly.



Bombs, Bombs, Bombs

North America's F-100C Super Sabre swoops into the air with a total of 7,000 lbs. in bombs beneath its wings. In actual combat, loads had could be either three or fourfold. To increase its range, the Super Sabre is equipped with air-to-air refueling probe.

Domestic

The White House will announce the appointment of Dr. Clifford C. Fenn, Director of the University of Buffalo, as Assistant Secretary of Defense for Research and Development. Dr. Fenn, former director of the Cornell Aeronautical Laboratory and director of research for Curtiss-Wright at Buffalo, will replace Donald A. Quisenberry who stepped up to the position of Secretary of the Air Force.

North American Aviation, Inc., in establishing a separate division to handle the company's nuclear engineering and manufacturing operations. To do, in agreement, North American let it be known that it plans to carve a larger niche for itself in the industrial atomic energy market. Royal Chatterton, J. H. Kneibler, "We are now ready to search, model, industrial and electrical power means in keeping with the... exploration of the Atomic Energy Commission." To be known as Atomic Energy, the new division will be located in a \$1.5-million facility in the San Fernando Valley and it will be headed by Dr. Chatterton. North American vice president and general manager.

The sleek, slender American Bosch Arma Corp., manufacturer of D-52 fire-control system, faced new problems last week. The Engineers Association of

Arms, an affiliate of the Engineers and Scientists of America and one of three striking unions, placed this ad in a New York newspaper "AVAILABLE," approximately 650 engineers and technicians with broad background in the development of complex fire-control and guidance systems... either part-time or full-time employment will be considered." The Arms strike-strike in four years—begin Sept. 30 upon the expiration of union contracts. An Engineers Association spokesman said the union will accept a 5% wage increase (it originally asked for 12%) plus an additional 14% "security (1944)," an Arms spokesman and it has offered to meet the 5% wage increase but that the company wants to agree certain fringe benefits now in force because they are widely restrictive.

The tiny A-4D Douglas Skyhawk holds the new world's speed record. Navy Lt. Gordon Gray flew the current attack plane at 695.163 mph over a 100-kilometer closed-circuit course at Edwards AFB. The Skyhawk became the last attack-type plane to establish a world's speed record over the 500-kilometer course, all previous ones having been set by fighter aircraft. The last previous speed for the aircraft (649.40 mph) was set by Maj. John E. Armstrong, USAF, in an F-86H at Dayton, Ohio, on Sept. 3, 1955.

Boeing's Wichita Division last week

delivered the last of an unproduced but "usable" number of RB-47 jet photo planes to the Strategic Air Command. The reconnaissance version of the B-47 Stratojet is capable of high or low-altitude, 600 mph day and night missions. First reconnaissance model of the plane was produced in 1951 under a unique program whereby B-47 bombers and photo planes emerged from the Wichita assembly line on alternate cycles. The dollar-saving move also noted the need for training separate manufacturing crews and did away with the necessity of keeping duplicate sets of possible and non-probable tools. The RB-47L in its present configuration carries seven aerial cameras within its fuselage and long, equipment-packed nose.

International

Baltica's Saumon Kaulski Alvest last announced last week that it has flown an lightweight (510 lbs.) jet SE-1 prototype. The aircraft, which previously will be marketed as a sport plane, has been given a price tag of \$15,000, or about \$17 a lb. Powered by a Turbomeca Pilon 510-hp-turbine engine, the SE-1 has an assigned maximum speed of 352 mph and an optimum cruise speed of 300 mph. Features include wing tips of slightly over 20 ft, an all-moving butterfly tail, oleo-pneumatic retractable bicycle landing gear, full-span flaps and tail pushing for load, ing.

AVIATION CALENDAR

- Oct. 15-17—Technical Conference on Aircraft Electrical Applications, American Institute of Electrical Engineering, Hollywood-Beverly Hills, Los Angeles.
- Oct. 20—Atlantic City Aviation Show, Flug Club, at International Aviation Industries, Inc., Wyndham County Airport, White Plains, N. Y.
- Oct. 20-21—Southwestern Airport Managers' Assn., annual meeting, Germantown, S. C.
- Oct. 22-24—Aviation Research Society, 11th annual dinner, Van Nuys Auditorium, Los Angeles.
- Oct. 24-25—1st National Radio Engineers, 1975 East Coast Conference on Automotive and Navigation Electronics, Lord Baltimore Hotel, Baltimore.
- Oct. 24-25—2nd National Electronic Engineers, Golden Anniversary, Vancouver International, Chase Hotel, St. Louis.
- Nov. 1-4—Society of Automotive Engineers, California Diesel Engine Meeting, Chase Hotel, St. Louis, Mo.
- Nov. 3-4—Institute of the Aeronautical Sciences and Canadian Aeronautical Society, annual annual joint meeting, Chateau Laurier, Ottawa, Ont., Canada.
- Nov. 6-8—21st Annual National Conference of the Canadian Institute of Aeronautics, Hotel Statler, Los Angeles. Robert R. Olson, president of Lockheed Aircraft Corp., will speak on "The Future of Aircraft."
- Nov. 8-10—National Aviation Trades Assn., annual convention, Hotel Westward Ho, Phoenix, Ariz.
- Nov. 9-10—Society of Automotive Engineers, Golden Anniversary Tech & Sales Forum Meeting, Bellevue-Stratford Hotel, Philadelphia.
- Nov. 9-10—Industrial Management Society, 19th annual line, session study, management, Dallas, Texas. Sheraton, Chicago.
- Nov. 10-11—American Society of Mechanical Engineers of American Rocket Society, annual convention, Congress Hotel and Macleay House, Chicago.
- Nov. 11-12—Aviation Electronics & Maintenance Assn., 19th meeting, El Mirador Hotel, Palo Alto, Calif.
- Nov. 14-17—Second International Aerospace Exposition, New York, Chicago.
- Nov. 16-18—Society for Experimental Stress Analysis, annual meeting, Hotel Sheraton, Chicago.
- Nov. 18-22—Symposium on Aeronautical Communications—Civil and Military, sponsored by Institute of Radio Engineers, Hotel Udon, Udon, N. Y.
- Dec. 2-4—21st Annual American Conference of Flight Clubs, sponsored by Traffic Chapter of Commerce and Transport Airport Authority, Kansas City.
- Dec. 6-7—Professional Rate Pilot's Assn., convention, Carter Hotel, Cleveland.
- Dec. 12-17—National Congress and Atlantic Exposition, sponsored by Engineers Joint Council, Cleveland, Westwood Auditorium.
- Dec. 15-17—Fall Meeting, USA Mineral Committee, USA Geological Survey, Boulder, Colorado, University of Florida, Gainesville, Fla.

PICTURE CREDITS

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KELOX

INSERTS AND STUDS

The simple key shown above is the real key to the simplicity of Kelo Inserts and Studs... making possible these many advantages:

- Provides a positive lock between insert or stud and parent hole.
- Prevents relative motion.
- Stands, under vibration and removal, for repeated trials.
- Increased strength for fast cycles.
- Allows maximum use of material in hole.
- Permits application in thin plates.
- No lateral stress—inserts install themselves in place.
- Suitable for both wet and dry.
- Several threads not required.
- Insert is permanent, no removal or plastic material without drastic changes in prepared hole.
- Most convenient.
- Permits easy removal and replacement without special tools.



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WHO'S WHERE

In the Front Office

C. M. Camben, elected chairman of the board of Parsons Inc., yesterday at Phillips held Co. John S. Stader elected president and general manager.

B. Brown, former, executive vice president of Raytheon Corp.

Kenneth D. Smith, executive vice president of Housatonic Inc., formerly vice manager of research for Thompson Products Inc.

Fred M. Goss, former executive director of The Post of New York, formerly, chief executive officer of Empire State Building Corp.

Honors and Elections

Oliver A. Raita, 75, long representative for Tennessee Air Lines, received a Civil Aeronautics Administration medal for his long service to civil aviation. Raita was a CAA inspector prior to his retirement in 1975.

John H. Gille, Lockheed Aircraft Corp., named chairman of Aircraft Industries Assn. committee on pricing and protection.

E. W. Stark, Alumnus of Civil Aeronautics, named vice chairman.

Andrew F. Billings, Bell Aircraft Co., appointed vice chairman of Gen. Taylor Force Div., Washington, section of American Society of Mechanical Engineers.

Changes

Dr. Charles C. McDerwick, research director of Bell-Jock Scientific Instrument Co., Salinas, Calif., elected, Chairman E. Forbes, manager of Technical Employment and Training.

Dr. Albert F. Thompson, chief of Office of Scientific Information of the National Science Foundation, Clyde C. Hall, position information officer.

Robert D. Ehlman, chief of Composites and Technology Section of National Bureau of Standards.

Vernon G. Orsinger, special section section of Science, Aviation Co.

George G. Hilde, press attorney for the Federal Control Div. of Douglas Aircraft Corp., Forest L. Decker, industrial affairs director of Boeing Products Div.

James R. Barrett, commercial sales manager of California Div. of Lockheed, in chief Corp., Thomas F. Ingemann, formerly vice manager of Wright Aircraft Division, Certe-Wright Corp., joined commercial sales staff.

William W. Yagel, chief of sales engineering and flight test dept. at LearCo. of Lear, Inc., for General Electric Yagel is national service manager.

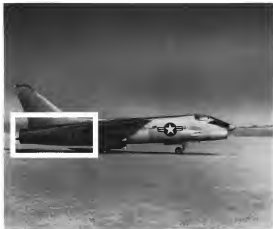
Fred Bailey, vice manager of Constair Div. of Constair Inc., formerly, sales representative, Joseph J. Ciffone, assistant chief engineer, Harry H. Webb, Jr., product sales representative.

Kenneth D. Smith, former vice president, public relations director of Westinghouse Air Lines, Bert D. Lyon, advertising staff sales promotion director.

(Continued on p. 92)

INDUSTRY OBSERVER

- F3D fighter which Douglas' El Segundo Division is building for Navy is a refinement of the F4D with slower wing and tail, longer fuselage and higher horsepower ratio. First F3D probably will come out the line early in 1976.
- General Electric has devoted big engine in advance development. In the 15,000 lb. thrust category, it will be small enough for aircraft into current operational aircraft.
- Hughes Aircraft Co. and Sperry Gyroscope Co. reportedly have won the Navy selected contract for the development of the control system suitable for long range interceptors.
- Successor to the Glass Matrix PIM SeaMatrix on the company's drawing boards is known as the SeaMatrix. U. S. Navy has proposed, standardized by Air Force interest in the sea-propelled missile, not perhaps for future development. A major feature of concern is the possibility that Cervi-Robin will outpace U. S. program in the field.
- Atomic Energy Commission and USAF are consulting CAA Medical Division on the possibility of using commercial aviation to take samples of the atmosphere for study of radioactive particle count.
- Several military aviation equipment manufacturers are trying the growing business aircraft market for communications, navigation and flight control equipment. Interested companies include A. C. Smith Flight Division of General Motors, and the Conquest Division of Avco Manufacturing Co.
- An intermediate vertical speed indicator engine, several devices to eliminate lag encountered in the lag used conventional airspeed indicator, is under development at Sperry Gyroscope Co.
- The industry are now to get a look at a radically improved altimeter that gives instantaneous readings to a guaranteed overall accuracy of 1 part in 3,000—equivalent to between five and 10 ft. at sea level and 40 to 50 ft. at 45,000 ft. altitude. This could make more noise in crowded air space. High accuracy and simplicity of the system are due to specially designed micro-circuitry operating in a system that eliminates time-consuming bearings and gear trains between sensing element and indicator.
- Hughes Aircraft Co. has moved to directly by forming a new commercial products division. It will expand military aviation development which have civilian and industrial customers possible. The division is now to get its new strong-type outside air tube to airlines for use in weather radar and air traffic control signaling system. SeaMatrix division is the only parent Hughes commercial product.
- Volkswagen-Audi expect to boost the speed of its Vincent super from the current 325 mph to 365 mph by the use of the chassis development stretch version of the Dietzberg. This 365 development is expected to boost Daimler power to over 2,100 hp, though component efficiency improvement.
- Aircraft certified for landing and spinning now land more than 4,200. Plans for this purpose should be set now in 1975 with 3,150,000 aircraft of forest aircraft control in flight against 1,600,000 spins reported to control spinners.
- Rolls-Royce Conway includes engine is now meeting its official type test used at producing a rating of 13,000 hp for commercial applications. Military thrust ratings of the Conway are considerably higher.
- Pilots of the South African air force will be trained in Canada to fly the Canadian-built Sabre F-86 Mark 6 fighters. When delivery of 37 planes on order is started next April, first instructors will start flying again to South Africa until two squadrons are equipped. Order is worth \$10 million.



TITANIUM and the "hot end" of the XF8U-1

Engine and aerodynamic heat tests up to make the aft section of the Navy's Chance Vought XF8U-1 really hot.

That's why there are hundreds of pounds of titanium in the "hot end" of this fast, new, mirror-based jet fighter. For each of titanium's remarkable properties has a direct effect on over-all performance: its resistance to heat, coupled with high strength-weight ratio . . . its unusual ability to withstand corrosion, and salt-air pitting . . . its freedom from stress-corrosion cracking.

REM-CRU, a leading producer of titanium, led in the development of titanium alloys for aircraft applications. Now, its greatly expanded facilities insure prompt delivery of REM-CRU titanium in all standard mill products . . . in a wide variety of sizes, shapes and grades, including the new high-strength, weldable alloys. And REM-CRU's engineering staff has available extensive information on titanium's performance in practically every type of aircraft—it's at your service.

To keep abreast of the latest developments in this vital metal, write to Dept. AM for the Rem-Cru Survey—of free, technical processing the latest technical data on titanium alloys.

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TITANIUM**

REM-CRU TITANIUM, INC., MIDLAND, PENNSYLVANIA

New Look for Carriers:

Steam Catapults, Mirror Landing Device



ABOARD Hancock, PTU-3 is hoisted to new type steam catapult.



GROUND crew makes hookup with catapult and gives ready signal . . .



STEAM rolls up as catapult prepares to shoot PTU-3 off deck . . .



GOING full blast, catapult sends C-119B down deck for takeoff.



NEW landing system (positive arrest and light) on Birmingham . . .



Crews test test in PTU-3 lands. Unit indicates glide path, altitude.

PAA Order Touches Off Equipment Race

BEA buys Vanguard; New York Airways, S-5Bs; Lockheed revises Electra; tourist DC-8 announced.

The international air transport industry, armed with new equipment deals last week, is the victor of the second \$300-million jet order taken placed by Pan American World Airways (AW Oct. 27, p. 7).

At U. S. and British airborne and engine manufacturers' meetings around the fringes of the 14th annual general meeting of the International Air Transport Association in New York, the following developments occurred:

- **Vickers-Armstrongs** sold more than 20 new 35-passenger Vanguard transport to British European Airways. The Vanguard (V-300) will be powered by four Rolls-Royce RB 109 turbo-propellers. Fuel consumption on quantity and price of the BEA order are now under way.
- **Sikorsky Aircraft** sold seven S-55 helicopters to New York Airways for \$3 million. Another sale of an unspecified number of the 12-passenger helicopter

to Sabem, Belgian National Airline and international transport helicopter operator, will be officially confirmed in the near future.

• **Lockheed Aircraft Corp.** has released the latest revised design of its Electra turboprop transport (AW June 13, p. 11) to the production department at its Burbank plant. New Electra design features a triangular vertical fin, larger wing area, higher gross weight, larger payload and longer range.

• **United Aircraft Corp.** revealed that the Pratt & Whitney JT5 jet engine, now being tested at 15,000-33,000 lb thrust will be available in commercial versions of the Douglas DC-8 and Boeing 707 jet transports. F. B. Harshbarger, UAC chairman, said the military versions of the JT5 will be in production next year and such military service by 1957 to permit two full years of operational experience before initial commercial deliveries are made in 1959.

• **Boeing Airplane Co.** flew its model 707 transport prototype on a spectacular transcontinental roundtrip in 5 hr. and 16 min. The 707 jetliner by A. M. (Tom) Johnson flew the 3,040 statute-mile stretch from Seattle to Washington, D. C., in 3 hr. 53 min., averaging 592 mph and returned to Seattle in 4 hr. 8 min. Top speed recorded was 645 mph. The 707 cruised between 13,000 and 15,000 ft altitude and maintained cabin pressure of 8,000 ft. It carried 74,800 lb of fuel and had 16,900 lb remaining on landing at Washington.

• **Douglas Aircraft Co.** revealed a high-density version of its DC-8 jet transport that can carry 131 tourist-class passengers on the nonstop trans-Atlantic hop. The high-density DC-8-5 features three aisles running on both sides of the center aisle. Douglas said the DC-8 will carry a 31,100 lb payload over the 3,315 statute mile route from New York to Paris in 6 hr. 25 min., cruising at altitudes between 10,000 and 40,000 ft at an average speed of 555 mph.

BEA Buys Vanguard

British European Airways finalized its order for Vickers-Armstrong turboprop aircraft with the announcement that it will buy a fleet of Vickers Vanguards, recent and biggest of the turboprop series which started with the Viscount.

The carrier is now in final negotiations for an order of 20 to 25 Vans.



REVISED Lockheed Electra turbine four-engine setting is shown in artist's drawing. New Electra has greater wings, payload.

gards powered by 4 Rolls-Royce RB 109 turbo-propeller turboprop engines.

Delivery of the Vanguards is scheduled for 1959-60. The order for the new airplanes, plus new and current orders for RB 109 series Viscount, Mayan, announced BEA's equipment plans well into the 1960's.

BEA believes that possibly within three years it will have an all-turboprop fleet, with the exception of aircraft needed for mail operations in Scotland. If a small turboprop, such as the Fokker F 27, could be found that suits the BEA, the carrier could have an all-turbine operation within three years.

Vanguard Statistics

The new Vanguard was designed by Vickers to meet detailed BEA specifications for a short and medium-haul transport. It is a twin-engine, four-engine design and will carry 91 passengers in the BEA configuration (five abreast cabin seat).

"Double-huddle" seating will be used with the upper part divided into three passenger compartments. Two luggage and freight holds are in the lower part. Variant has 104 passenger capacity if it is fitted in other ratios.

Performance of the Vanguard is tied to development of the Rolls-Royce RB 109 engine that will power it. Initially, it will be a 4,470-shp engine and the airplane will cruise at 460 mph.

At RB 109 power is increased to 5,000 shp, cruise speed will go to 515 mph.

Vickers and BEA believe the Vanguard has an ultimate potential of carry-



BEA CUTAWAY model on display during IATA meeting shows five-engine setting in two- and four-engine, as shown in text. Model also gives good platform view.



MODELS show size increase of new Vickers Vanguard (foreground) over Viscount 700.



SIKORSKY S-55, 12-passenger helicopter has been purchased by New York Airways.

avg 90 passengers over 2,180 miles stage length of at least 490 mph, and that it could be operated over 86% of the world's routes.

Rolls-Royce has been length testing the RB 109 and plans its first flight test only next year in a Lincoln flying test bed. The engine has been designed around an axial-flow, eight compressor stage has a 12 to 1 pressure ratio for low fuel consumption.

The Vanguard, which will be tender to the Lockheed Electra, is designed for short and medium hauls and is not capable of flying such long-haul routes as the North Atlantic route. BAC's average is about 500 miles, and the current longest route—London to Korea—is less than 1,000 miles. BAC thinks the Vanguard aircraft will initiate its work well into the next decade.

To supplement the high demands Vanguard, BAC is offering additional Viscount Maestros. The new order will be for the 566-powered, with Rolls-Royce Dart R. D.7 engines. With the new engine, it will cruise at 560 mph. It is expected by September 1957.

BAC funds its air sales with Viscounts for US \$60 Viscount Maestros. This aircraft, expected to fly next year, is powered with the Dart R. D.6 engine and will cruise at 520 mph with 65 passengers.

Viscount plans to develop the 800 series into 1950 and will have a speed of 600 mph. The 700 and 800 series will be manufactured together, starting next year. Production of the Vanguard will begin next year and the first aircraft off the line will be used as a prototype by Vickers.

838 Order

New York Airways' recent Saturday 8:38a (renting \$100,000,000) are scheduled for delivery starting next spring.

Delivery of the aircraft will give New York Airways the largest helicopter operation in scheduled service anywhere. The aircraft will be added to the carrier's current fleet of five Sikorski S-55's. The S-55 will be replaced by a Wright R-1120 engine, producing 1125 hp. It will cruise at 105 mph and carry twelve passengers. Lifting power will be 4,000 lb.

Performance of the S-55 is a substantial increase over that of the S-55 which has a 600 hp engine, cruises at 85 mph and carries five passengers.

"All of these benefits will be passed on to passengers in sparser service, more frequent, more exact, more convenient schedules, than now possible," NYA president Robert L. Casanovi and other executives the order.

"This will mean that present airport landing schedules will be shared to fully busy operations."



SPERRY light-control and search helicopter all ground. No hands on controls.

Flight Control Systems Designed for Copters

The development of a 60 D automatic flight-control system, believed to be the first capable of stabilizing flight path and heading as well as maintaining constant altitude and speed, was announced last week by the Sperry Corporation Co., Division of Sperry Rand.

The new system which will increase the helicopter's all-weather capability, is scheduled for production in December (AW Oct 17, p. 15). Sperry officials say the cost is a decrease of a new set of simplified helicopter flight instruments to plan to produce.

The light-weight system provides five channels of automatic control:

- Heading, by controlling "rotor" pitch.
- Rotor speed, by controlling, by controlling the cyclic pitch stick.
- Roll and yaw, by controlling cyclic pitch stick.
- Automatic attitude by controlling rotor pitch.
- Rotor speed, by controlling engine throttle position. (This feature is developed under sponsorship of the Wright Air Development Center.)

Like the new automatic for forward military service, the Sperry light-control autopilot enables the heli-pilot to override the automatic system and introduce maneuvers through the regular control stick and pedals.

Automatic hovering over a fixed spot, at constant altitude, is possible by using Sperry system with inputs from manual devices in the helicopter as well as integrated new sensors, radar and ground radio signals. It also opens up the possibility of platform helicopters

operations for such things as sailing cargo to a landing position or lowering a submersible.

Sperry reports that the system requires operation (through battery power) despite engine failure, to maintain constant rotor speed and provide stabilization until the point of flare-out.

Sperry, and "rotorcraft" design, is the inventor's creation, and provided duplicate amplifiers (Schubert) tubes or transistors are used so that failure of one unit does not incapacitate the system.

Adm. Pearson Asks Support-Policy Review

Los Angeles—Adm. John D. Pearson, Jr., USN, last week proposed a strong review of the Navy's aircraft support equipment program.

"Development of support equipment in readiness and pleasant air support as of major interest," Pearson said, following formal acceptance last week of command of the Bureau of Aeronautics' Western District.

Under his broad management and technical control, will be the major Bureau of Aeronautics representatives and their resident representatives who have aerial inspection responsibility over such programs as Douglas Aircraft Co., Lockheed Aircraft Corp., Convair, Convair Aircraft Corp., Hiller Helicopters and Aerojet-General Corp. Pearson said the importance of a support equipment program reflects a reinforced need a fact as aircraft is as better than the ability to get it in the air.

He noted that over half of the Navy's aircraft contracts are in the Southern California area.

Wilson Seeks Tighter Spending, Orders Review of Procurement

Washington—Defense Secretary Charles E. Wilson, adamant in his stand that the national defense program will be controlled, nevertheless last week took two steps to reduce maximum resources and efficiency in present program.

After ordering the tightening of 65,000 civilians on the department payroll, he directed the military services to tighten up on procurement and production. There was no selection that they will be shared.

Wilson also asked Deputy Defense Secretary Robert H. Robertson, Jr., as chairman of an ad hoc committee to study ways to shorten the development time of aircraft and helicopters.

The group, which will look into all phases of research, development and procurement, also includes Frank D. Newberry, Assistant Secretary for Applications Financing, Robert D. King, Deputy Assistant Army Secretary for Financial Management and James N. Dean, consultant to John Hopkins University Research Office. King will serve as executive director and Dean as technical director in the committee.

An Air Force spokesman did not feel that Wilson's request for new peace-time resources would have serious effect on aircraft industry contracts. Some tightening up is to be expected, but most of Wilson's suggestions, it was pointed out, duplicate USAF policies already in effect.

The Secretary laid out his program as a memorandum which he referred to as a directive. He is offering "guidelines," he said, and reluctantly set a figure of about 5,000 million in the amount he wants to save, bringing the

department's Fiscal 1956 spending within a level of \$44 billion.

There were some hangings among defense agencies which report that the Wilson "grade line" was a result of an aircraft procurement study. This thought was denied by Pentagon spokesmen, who believe that the Secretary will stick to his guns, particularly the 137-wing Air Force.

It was pointed out that there is a difference of opinion between the Army and Air Force, for example, on how long a new war would last. Army would prepare to fight two years, USAF believe the shortest war will extend to 30 or 60 days.

In his memorandum, Wilson said "critical examination is to be made of current plans for support forces and the acceleration of mobilization resources to assure that they are established at minimum level of force, with the requirements of the Pacific Area to the Joint Mail Road War Plan.

"Where mobilization means less, present plans against substantial increases, delays of material on order will be delayed to the extent possible without incurring substantial increased cost, and the placing of necessary follow-on orders will be avoided."

Discussions led by Wilson include:

- Tighten up on flight time, particularly in the field of proficiency and non-controlled flying.
- Restrict overhaul and modification program to equipment for current use.
- Reduce stock levels of spare parts.
- Increase maintenance of aircraft.
- Salvage equipment, obsolete aircraft.
- Hold to a minimum the utilization

of contracts awarded to private industry and field representatives.

- Review requirements in the light of availability of stockpile supplies.
- Evaluate existing contracts, modify requirements.
- Cancel contracts for unnecessary material except when termination costs would be excessive.
- Eliminate unnecessary multiple sources of supply.
- Reduce procurement of development type items.
- Adjust buying to reduce stocks on hand where possible.

Wilson made it clear that high-priority items in the R. & D. field will continue to get emphasis.

Wilson said confidence of new production program is necessary so that others "can be adequately supported within the approved level of expenditures."

Piasecki Helicopter Stockholders to Meet

Stockholders of Piasecki Helicopter Corp. will meet this week to consider a new plan of corporate reorganization and the possibility of changing the corporation's name. With plans to resolve mid-term controversy, a proposal of the chairman that the company name be changed to Vertigone Corp., to distinguish it from Piasecki Aircraft Corp., may raise a legal tangle by creating the Ryan Aircraft Co., of San Diego, Calif., has an application pending to register the trademark "Vertigone" for its aircraft. Piasecki is a new company founded by Frank N. Piasecki after he was ousted as head chairman of the original company.

If the Vertigone name is not available, money will be sought by the Piasecki Helicopter corporation to defeat the proposal and another title will be sought.

Another management plan, to make \$100,000 share of stock available to company executives and low employees at a bargain price, is the subject of a dispute between Piasecki and Don R. Berlin, president and now head chairman of the company.

Piasecki has asked stockholders to vote against the proposal, warning that it places control of the company in private hands. Berlin has denied this, claiming advantages over the sale of stock, over the public exchange and holding that the total percentage is too small to cause control by the retained management.

Also at this week's meeting, action will be taken on the resignation of Thomas K. Fiskette, former Air Force Secretary, and John F. Fiskette, former Assistant Secretary of the Navy for Air, to the board of directors.

TAC Gets Probe & Drogue Tankers

The U. S. Air Force is converting 180 B-50 bombers to three-point refueling tankers for the Tactical Air Command. The multi-mission dollar conversion contract awarded to Douglas Aircraft Corp., is the first large USAF commitment for the probe and drogue refueling equipment for Tactical Refueling tankers.

TAC has long asked a commitment for multiple probe refueling for its fighter and fighter-bomber assets. It has been using KB-29s, "tanker dogs" from the Strategic Air Command and equipped with the Boush-developed single probe flying boom system.

The KB-29s will be closed up accordingly, adding a few tanks to its current 30-40 tank dog advantage over the KB-29. With the added probe and the equipment to fuel three F-4Es or F-100s simultaneously, TAC believes the KB-29s will meet its requirements for the next three to five years.

Model A-1000 Probe Refueling tank and units will be mounted at each wing by the end of the year.

TAC's F-4Es, now equipped for flying boom refueling, have a probe receiver. It will work to change the boom receptacle in the wing, just combined from the cockpit.

'Misadventure' Caused Midge Loss

The Folland Midge, prototype of the Gnat (AW 07, lot 74), crashed in England Sept. 17, after a "protest" landing on (AW 07, lot 13). Mrs. Mather, member of a Swiss Army Air and Supply Department detachment which was planning to purchase six Midgets, was flying the aircraft. Aeronautics War has received the following report from an eyewitness:

"Mather was the twenty-first pilot to fly the Midge. We were fully briefed by Ted Tennant (Folland's chief test pilot) and after the briefing was over we were to leave the cockpit and have a top of cut off before making the flight. He advised the situation, advised for and received permission to not cut off and later he proceeded to take off.

"As that the take-off was normal, and it was not until the Midge was still on the runway it a point well past that at which it should have taken off that the noise was felt by the knowledgeable among the spectators. Some eye witnesses and the Midge left the runway by a short distance, but photographs taken from after the crash show that our wheel, at least, was on the ground when the Midge ran off the runway, after the grass overtook us, and that all three were having had within a matter of 20 yards or so.

"The distance from the end of the runway to the line of from taking the wheel off at the point is about 120 yards. After about 300 yards it begins to slope away quite sharply. The Midge, still on the ground, left a ridge about a hundred yards from the line and shot into the air in a steep nose-up attitude. It seemed later it hit two fir trees and started to land, up at it cartwheeled into some rocky meadows alongside the River Trent. The top of the two trees were knocked off about 20 ft. The three trees, left, and the wings of the Midge remained in position though cut through from the leading edge to the main spar on each side by the two fir trees—cut through that the pilot must have had to fly between the trees.

"The point of impact with the trees was found to be 14 ft. below the level of the end of the runway. No change in the engine note occurred until the Midge hit the trees, and the engine would have been going very fast indeed when it hit into the over-forest area. No one was really in a position to see whether the Midge was actually going right when it hit the trees, but it had been only 20 ft. higher it would have crashed then.

"At the impact, held two days later, the witness said that there was strong

evidence that the Midge was actually airborne when Mather crashed into it and as a consequence a verdict of death by manslaughter (regard that the accident was most probably attributable to the human factor).

"Given evidence, Ted Tennant said that he had landed the pilot in fully as

Douglas Indorses USAF Policy To Penalize Performance Failure

Santa Monica, Calif.—Douglas Aircraft Co. has mentioned its approval of the new Air Force policy regarding financial penalties against firms failing to meet performance guarantees.

The aerospace company believes, however, that the policy could be applied as a long-term basis rather than on specific contracts.

This statement by Donald Douglas Jr., vice president, was made at the first meeting of the Military Products Division of the Radio-Electronics-Telecommunications Arm (RETEMA).

Douglas pointed out that for some applications of the go-go-go policy might discourage companies from taking large steps forward in attempts to advance the state of the art, he added.

"So that manufacturers will be willing to take a reasonable chance and learn from failure, I believe that a company's performance should be measured on a long-term basis rather than on a specific contract."

Douglas and his company favor the principle because it will result in more realistic design specifications.

"I am assuming that it will be limited to applications of the go-go-go policy and that the same policy applies to research and development work will result in the best of results."

Getting possible results, he said. "Suppose, for instance, that the probability of a 90% kill probability on a fire-control target and had your probability cut in half because you could only deliver an 85% probability. Next time you probably would not use the chance and would only guarantee 90%."

New Rig a Step?

He said then is the biggest problem in national defense today. "How big a step forward should we take in the state of the art at a given time? We can go into trouble either way, by going too far or by not going far enough."

The Douglas statement came shortly

possible and had been most careful to stress the importance of having a correct balance between the two. He said, in fact, that the policy was clearly before Mather, based on the take-off. A member of the Swiss aviation, at which Mather forced past, gave evidence that he was present when Tennant landed the pilot and had, in fact, been told that the Midge was to make sure that the pilot understood them. This version was stated that Mather had been adequately instructed in the Midge's flying technique.

after Maj. Gen. T. P. Gerry, USAF Director of Procurement and Production Engineering, and the Air Force will eliminate development programs which fail to offer large gains in performance (AW Oct. 17, p. 12).

Douglas said the new Air Force program will be applied to the same way some aerospace companies, along with other component suppliers, are going to have to change their attitudes considerably. They can no longer expect to be able to get away with a general rule will include the same rule. AMC, an addition of paper design studies this summer (AW Aug. 8, p. 12), said it would further conserve its industry's engineering effort by reducing Phase I expenditures to construction with present ability.

Evaluation Evaluation

Stressing the importance of plus value, the statement said the new official cited this memorandum from the Douglas equipment group to the chief engineers. It concerns the design program for the D-3.

"In the design program, equipment group engineers will also account the electrical and mechanical features of the generator, regulator, protective panel, control equipment and connecting devices. These were evaluated and will be compared with the specifications but for any additional features or plus value."

Simplicity and accessibility were also taken account. The finished weight of the equipment, including wiring, was determined and included in the evaluation. Other factors evaluated to the best of our ability was the equipment group involved, the service facilities and personnel which would be available, the experience of the companies with comparable equipment and institutions and the development status of the equipment being proposed.

Douglas said that the "plus value" members are going to be increasingly important as both the military and commercial fields because they help to guarantee performance.

ARDC Reorganizes, Tells More Secrets

By Claude Wirtz

Baltimore—An Research and Development Command has streamlined its headquarters organization and is prepared to ease the secret classification of System Requirements in another defense branch. Air Force chief to spot aircraft industry development of advanced weapons systems.

Like the program to lift restrictions on Technical Planning Documents (AW Oct. 17, p. 12), details on System Requirements will be handled set on a restricted basis. They will be given to a few companies in semi-annual agreements designed to take full advantage of the actual industry's top engineering talent and development facilities.

Industry is that the companies entrusted with ARDC's System Requirements, which involve highly secret details of USAF's air planning, research and development, will be more weapons system contractors. The list will be an indicator and not much larger than the Air Materiel Command's list of potential contractors for a given weapons system. The general rule will include the same rule. AMC, an addition of paper design studies this summer (AW Aug. 8, p. 12), said it would further conserve its industry's engineering effort by reducing Phase I expenditures to construction with present ability.

Key Key Post

Most significant of ARDC's organizational changes is the establishment of a Deputy Commander for Weapon Systems, a post initially filled by Maj. Gen. Albert Boyd, former commander of Wright Air Development Center. Other deputy commanders under the new setup are:

- **Reg. Gen. Kurt M. Landis**, Deputy Commander for Research; Col. Thomas S. Power, ARDC Commander that proper managerial control over

weapon systems can be realized only by the consolidation of planning and policy making functions at headquarters of the command.

The reorganization is part of Gen. Power's plan to meet the challenge of fast-moving Russian development with "big game." USAF still finds the facilities and threat to do the job and a demand to force industry to create more of both and use them at peak efficiency. Performance in this case now clearly is the basis for competition.

Seek New Concepts

Great stress is placed within ARDC on the organization in the office of the Deputy Commander for Research & Development, designed to put emphasis "on the development of new concepts and equipment which can be introduced into new weapons."

Separation from this office of weapon systems, placing them under a separate command headed by Gen. Boyd, is an important step in this direction. It places ARDC control of systems at a command level near the top, apart from all the other R & D positions concentrated in the do-it-yourself system of Baltimore headquarters.

"One of the big problems a big program is, after all, American Wirtz, "is the fact that deadlines have to be set during the growth of a weapon system, and the critical decisions must be made at the time that had to be done under the old Technical Operations Office. Now we have a setup that can give its entire attention to problems coming out of the Weapon System Project Office (WSPPO)."

WSPPO Action Spurred

Under Gen. Boyd, there now is a Directorate of System Management, headed by Reg. Gen. Harold M. Ertz, who also serves as assistant Deputy Commander for Weapon Systems. Under him are the ARDC components of the WSPPO. These include offices for equipment and hardware and program control as well as divisions covering benchmarking, aircraft, fighter aircraft, bombardment aircraft, supporting sys-

tems, cargo and transport aircraft, fighter aircraft, land defense and military wing and liaison aircraft.

For the weapons, separate sets of officers from the other two branches of ARDC's Research and Development should result in faster action on the tremendous amount of paper work that accompanies early development of a new system.

A counterpart of the System Management Office under General Boyd is the Directorate of System Plans, headed by Col. Ernest M. Langguth. It is from this office that ARDC's System Requirements will be distributed to a few highly qualified contractors.

Must Show Capability

Qualification to know the System Requirements, Col. Langguth said, will depend on their future.

- **The preliminary design capability of the contractors.** They will have more time because the long range was to keep preliminary design groups in the industry free and working up new ideas. Standardized contracts, it is hoped, will result in rapid development that will contribute to "big game."
- **The fit of the contractor's design.** The fit of the contractor's design is a particular field of development.
- **The new ideas already produced or suggested by the contractor.**
- **The contractor's existing facilities.** This does not mean that an aircraft company will be one in the requirements simply because he has a facility. He must meet other qualifications as well.

As in the case of firms allowed to draw the secrets of ARDC's Technical Program Planning Documents, contractors who receive notice of the System Requirements will not get a contract to pursue any particular project. They must see their own money in exploration of the field in which ARDC considers them qualified.

On the other hand, ARDC does expect that contractors will come up with proposals and they are encouraged to do so. From time to time the industry may submit where a study shows the contractor's proposal and the ultimate weapon system is realized by ARDC.



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From Canon: A New Concept in Helicopters.

Cessna CH-1...designed for less maintenance!

Cessna's rugged, all-rotal CH-40 brings outstanding performance to helicopter flying. The new helicopter can climb from sea level to 10,000 ft. in less than 30 minutes. It can hover easily at 10,000 ft., has speed of over 120 m.p.h.

The simplified mechanical detail of the CTS-1's revolutionary transmission, rotor assembly and drive system eliminates many extra parts requiring lubrication and service, cuts down on maintenance costs.

The CBI-1's engine location—in the nose of the fuselage—is an example of the new helicopter's free-revolving design. Mounting the engine forward means important savings in weight, vibration and servicing time, provides extra cargo, a mezzanine space.

Development of the CTI-I also uses three years of intensive research by Genoa designers and engineers. The new helicopter fits a difficult-toed, is a noteworthy contribution to aviation.

Josh Lee Protests
Short-Haul Mail Rates

Fixed-fee rates set for local service airlines by the Civil Aeronautics Board have drawn a minority protest from CAB member Josh Lee.

The new sites established the crafts element formally principle for the local artists with standard pay, for line hours and increased benefits.

Lee says the new formula doesn't offer a reasonable price for air mail service. He favors establishment of a minimum surface charge for low traffic points.

³ Under the new rate, which became effective Oct. 1, the local surface was set a line haul rate of 18.07 cents a ton-mile and a terminal rate ranging from 3.32 cents to 39.21 cents per pound according to the traffic generated at the station (NW Sept. 26, p. 107).

The new scale, similar to one now applied to the truck owners, will pay the local corners about \$3-\$7,000 a year. Separate rates are set for individual lots for the period July 1 to Sept. 30, 1993.

Lee filed a separate statement with the rate order in which he asserted that the readjustment rate formula doesn't pay carriers enough when applied to small volumes of mail at stations which don't produce an appreciable amount of traffic.

Lay issues a nonrenewal terminal charge of \$15 a day. In support of his argument, he quotes a study of terminal costs made by the C.I.A. Office of Current Accounts and Methods which found that the nonrenewal status cost per day which can be charged to most vessels is \$10. Lay would not the charge at \$15 to cover such factors as general administrative costs and return an investment not covered by the study.

If the maximum stream charge were applied, it would reduce the local land rate to 29 cents a front foot. There is testimony of the rate structure would pay the local carriers about \$2,316,000 a year.

Airborne Surface Mail

Approximately 60% of the total first class surface mail volume is now moving by air, just two years after the Post Office Department inaugurated its experiment of shifting surface mail on a space available basis, according to an official report.

Applying the success of the original Postmaster General Arthur Summerfield said that "nearly a billion letters a year are being delivered sooner, on average, in 48 hours in many instances." The night operation has been expanded to provide direct service to 200 cities in 33 states.

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Hardware Requirements

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UAC-Rensselaer Combine Talent; Evolve New Concept in Education

By Jerome E. Kelley

South Windsor, Conn.—An unusual experiment in engineering education is being conducted in this quiet Connecticut community at Rensselaer Polytechnic Institute's Hartford Graduate Center.

The center is a cooperative venture between United Aircraft Corp. at East Hartford, Conn., and Rensselaer Polytechnic Institute in Troy, N. Y. (AVR June 15, p. 40).

Filled to capacity by 238 students, most of them engineers employed by UAC, the new center has broken several precedents in education.

It is a great reversal of education and industry's pioneering in the educational field is an effort to do something about the serious shortage of scientific and engineering talent.

Behind the thriving new center was the fact that UAC had become increasingly disturbed at seeing its new test and engineers leave its laboratories

and assembly lines to seek graduate degrees in their chosen field at distant universities. With the problem a growing one, UAC moved to solve it.

Within six weeks, UAC and RPI, the nation's oldest engineering college, had set up a plan for graduate education in the specific identified area.

Two full, five months from the time of the plan's inception, the center went into operation with a 23-student faculty.

UAC has furnished a 22,000-sq. ft. building at South Windsor as an outright gift to RPI. It is the former site of UAC's nucleus prewarplant laboratory. The building, cutback converted, contains 16 classrooms, two seminar rooms, a lecture hall, library, study rooms, collections and 24 offices.

United's Program

All qualified employees of UAC will be admitted to the new center, and the company will underwrite the full cost of tuition. At the present time, all but two of the students are employees



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Hinged Cowl Simplifies XHR25-1 Engine Inspection

Easy accessibility to Pratt & Whitney XHR25-1 engine on Sikorski S-55 helicopter is shown by the photo of engine cowl hinged downward, exposing most of the power plant.

AVIATION WEEK, October 30, 1953

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1990-91	20	8	11	6.25	6.50	6.50	ASSEMBLY Q1 A
1991-92	30	10	8.8	8.80	8.80	8.80	ASSEMBLY Q2 A
1992-93	40	15	14.1	3.75	4.00	4.00	ASSEMBLY Q3 A
1993-94	60	6	6	1.00	1.00	1.00	ASSEMBLY Q4 A
1994-95	110	6	5.8	5.8	5.8	5.8	ASSEMBLY Q1 B
2000-01	0	0	0.4	4.0	0.00	0.0	Net T. Change
2001-02	20	8	7.8	8.0	0.00	0.0	ASSEMBLY Q1 B
2002-03	40	15	14.1	3.75	4.00	4.00	ASSEMBLY Q2 B
2003-04	60	6	6	1.00	1.00	1.00	ASSEMBLY Q3 B
2004-05	110	6	5.8	5.8	5.8	5.8	ASSEMBLY Q4 B
2005-06	160	12	12	1.0	1.0	1.0	Net T. Change

^aThese organisms probably interacted for longer time intervals continuously up to 10°C and then were not subdivided further.

^{††}The paper on hand provides a DC output of 20 volts, 50 amps capacity at 100% duty cycle. AC output.

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 (Dept. 104), Quebec International Station, 200 St. Charles, New York 17, N.Y.



of UAC, but several other companies in the area have shown great interest in the program and may come join the venture.

The cost of a full course towards a master's degree—two to two and a half years—will be approximately \$2,000. Classes are scheduled for Monday, Tuesday, Wednesday and Thursday nights, but students are encouraged not to attend classes more than two nights a week or carry a workload of more than six credit hours per semester.

In the UNC program, whenever classes conflict with wedding hours, the company gets time off with bill paid to attend classes. At present, Master of Science degrees are given with majors in the following:

- Aeronautical engineering
- Mechanical engineering
- Mathematics
- Applied mechanics

Members are offered in several subjects, including nuclear chemistry, physics, engineering law and management engineering. It is expected that the list will be expanded into other fields of study in the near future and that as part of the expanding program, doctoral degrees will be introduced.

Solves Many Problems

The center is helping to cope with many joint problems that link, beach, and sea bathing—industry, and educational institutions. Answer them.

- **Importance of the ratio between graduate degrees and bachelor degrees:** a problem that has been increasing in advanced institutions. Most educators feel that, since a ratio has an increasing degree, there is an increasing number of graduates but, unfortunately, not with today's rapidly advancing technology, an increased ratio of advanced degrees is desirable.
- **Factors we continue work on:** critical defense programs while advancing the education of our people.
- **Future intentions will be able to read themselves of more research talent:** more faculty members will be able to do independent research and some academic nonresidents.
- **They greatly will provide a healthy environment:** a healthy environment is a healthy environment.

Reference Requirements

Entrance requirements for the Harvard Graduate Center are exactly the same as at the Annenberg Public Policy Institute campus in Evanston. A recent graduate with a bachelor's degree is selected on the strength of a transcript of his marks and recommendation, or at least three of his former professors. Prospective students who have been out of college longer are given the Graduate Record Examination.

According to Dr. Charles G. DeBerry



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wood, director of RPI's graduate division and one of the illustrious Goodyear Center's engineers, recalls of the birth of NAC personnel were amazing. He said:

"People taking the tests had been out of school for as long as 30 years and yet the results of the tests amazed us. They were far better than the national average."

Ed M. Hagan, president of GAC, had this to say about the new center:

"This program should not be confused with the usual company on-the-job training program. Modern technology is moving so rapidly, particularly in the multitude of sciences supporting aviation, that we must offer our working engineers an opportunity to broaden their background in the basic sciences. The new Hartford school will provide successful candidates with an advanced Master's or Ph.D. degree equivalent to say that one be cured of the very finest university graduate schools. If the working engineer at Goodyear goes away to graduate school, we lose him for at least one to three years. We decided that it was best to bring a graduate center here to meet this continuing problem."

Dr. Warren C. Stokes, former head of the computer laboratory at RPI, is the director of the new graduate center. He told *AerospaceWeek*:

"The inception of this new venture has been amazing. We have met with much enthusiasm at Hartford, and the cooperation and interest shown by United Aircraft has been magnificent. We of the faculty fully realize that this is a new venture in technological education, but we sincerely believe that as time goes on many new forward-looking American corporations and universities will combine under cooperative educational programs."

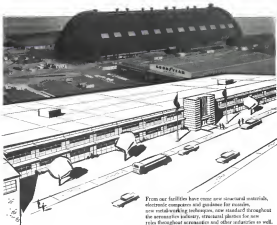
KLM-Air Ceylon Agree

KLM Royal Dutch Airlines will own 49% of Air Ceylon, and the latter's general agreement with Australian National Airways will end under a new arrangement expected to be concluded early next month in Amsterdam. Air Ceylon expects to charter a Constellation from KLM to establish Colombo-Australian service and after its establishment, plans to buy new equipment.

Viscount Prices Rise

Central Aircraft Airways announced that Viscount prices increase have raised the cost of its five transports on order by approximately \$160,000. Spurn, the company said, would cost \$45,000 above original estimates. The carrier also said it has experienced a substantial delay in delivery.

We're building another modern home for progressive pioneering!



That occasion has been laid for this new \$3,000,000 engineering and research building which will soon add to the expanding facilities of Goodyear Aircraft Corporation's huge Akron plant.

Its keystone will be pioneering—embodying an aggressive policy of "consistency" which has made Goodyear Aircraft the birthplace of many advancements which have done much to help "Keep America First in The Air."

As our nation's dollar Airline plans another month and development building is being erected as an investment in our air-ready America.

From our facilities have come new structural materials, electronic computers and gasolines for pistons, new metal-working techniques, new standard throughout the aerospace industry, structural patterns for new relief throughout aeronautics and other industries as well. Actually, it boils down to this:

As a example to emulate in this nation's aerospace and defense industries—Goodyear Aircraft chooses to build this great building facilities which take every advantage of its abilities.

Our skills get the full backing of our resources; our customers get the benefits.

GOODYEAR AIRCRAFT

☆ THE TEAM TO TEAM WITH IN AERONAUTICS ☆

De la

FRONTS..

These boundary edges of air masses produce much of the weather affecting flight.

OCCCLUDED FRONT—The upper front consisting of cold fronts and warm fronts. Not recognized as such on weather chart, but when present indicate a mixture of cold fronts and warm fronts characteristics. It's likely an occlusion has taken place.

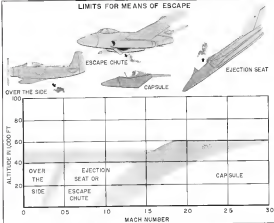


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LIMITS FOR MEANS OF ESCAPE



Pilots Demand Better Chance of Escape

The pilot, A. Scott Crossfield, test pilot at the National Advisory Committee for Aeronautics test facility at Edwards AFB told the 500 scientists, aerospace engineers, students, engineers and visitors, assembled at the ceremony,

'Expert talk,' he said, 'predicts of us

"The medium range of aircraft now in operational use can, in level flight, easily put one crystal pilot into the danger zone for human endurance. If we plot the speed capabilities of this series, we can predict that an appreciable number of our estimated jetson strength will be unsuccessful in terms of sustaining a viable crew member."—Brig Gen Don D. Fickinger of the Air Research and Development Command.

The meeting was sponsored by the Institute of Transportation and Traffic Engineering and Engineering Extension, University of California at Los Angeles in cooperation with the American Engineering Assn. and the In-

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- 2 TEF-FLEX hose is reinforced with stainless steel wire for long strength and tensile strength.
- 3 Permanent swage fittings, leakproof high pressure fittings.

- 4 This special designed stem permits removal of use for ease of installation in any application; also allows visual inspection of 37° seal.

- 5 All assemblies in stock sizes 4 through 20 utilize standard AN-418 cone or red fittings to customer specifications.



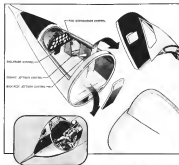
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3-355 ESCAPE with: All lower ribbed pilot stage back rest (front and left side)

provided the flexibility of the collapsible seat.

Paul D. Dugas, head of the Navy's Bureau of Aeronautics rocket system unit, reported that the Navy is continuing investigation and development of capsule type escape. No immediate plans have been made for incorporation of seat capsules. However, based on a recent decision, he said, all designs of future Navy aircraft which are capable of Mach 3 selected performance (which would be accompanied by dynamic pressures of 1,500 lb per sq ft or more) are to have a design study made to determine a better rocket capsule type escape can be incorporated without undue penalty to the airplane.

Ejection Seat Units

Replacing the escape pot into the seat, Dugas said that ejection seat use is limited to conditions approximating those at Mach 1 at sea level and corresponding speeds at higher altitudes.

"We may be able to extend these limits somewhat by development of heat-shielding during the ejection process by incorporation of this long means and by addition of weight to the seat."

Various capsule escape systems are being considered by Douglas, El Segundo Division's A. M. Mader, chief of the ejection and ejection escape section. These included a jet propelled nose seat and ejection seat capsule, an ejection rocket capsule and a seat comprising the forward

section of a high speed rocket aircraft design.

Navy said that operational readiness are being approached that are clearly beyond the capabilities of the current seat. The rocket capsule, he pointed out, often provides flexibility with respect to streamlining and the amount of useful equipment capable of being included in the escape system. He added that the overall weight penalty of the rocket capsule system may be less than that of an ejection seat system, with substantial drag weight absorption, for selected speeds that in some cases may approach values as low as Mach 3. The additional environmental and water survival capabilities inherent in the rocket capsule could not swing the decision in its favor in some head-on cases.

USAF's Lt. Col. John P. Stapp, pioneer in aviation brightness, told the meeting, "Between 500,000 hours the ability of the present system used to save the pilot begins to fall away."

He reported that a number of production fighters and bombers already have already been equipped with various type ejection seats which are inadequate for Mach 1, even though these planes are capable of considerably higher performance.

It is pointed out, too, to extend the useful range of the existing seat by retrofit or replacement so that escape under maximum performance conditions can be made from these fighters and bombers.

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Valve Talk

for WM. B. WHITTAKER CO., Ltd.

by Herman Allen,
Staff Engineer, Lockheed-Healey Arm.



Now that the Air Force is eliminating design studies in favor of Phase I contracts so far as aircraft are concerned, why can't the major companies apply a similar program to the supplier field?

It's worth serious consideration, for doing away with design studies in the procurement of aircraft valves, for instance, would accomplish the same goals as often in the field of aircraft procurement: save money, conserve engineering manpower, compress development time and improve the chances of obtaining a good product.

Aviation Week discussed the new approach as "having the cake, not placing the bet from the racing form." It carries it a step further and says it would be using the old racing form placing the bet from a single racing form selected from a group of racing forms, with these data points rendered visible and representing pure made-up line race money.

As it is now, perhaps fifteen suppliers are asked to design for a given job. They compete before the client in the hope of winning a contract. Yet they know—and the customer knows, too—that only one company will actually win the production order. The rest will have devoted dollars and cents to the process.

If the Air Force can pick a single company to do a job on the basis of past performance, know-how, availability of engineering effort and cost per unit workload, then there is no reason why that company should carry select to suppliers on that same basis.

Why shouldn't the suppliers as well as the prime phase be relieved of the constant but frequently futile pressure of designing on speculation, as it is now? Why not select suppliers, too, on the basis of their past successes in the type of work required?

It would prevent spending dollars to prove things in a time when engine availability is a critical problem. And without a design it would result in fewer products and greater delivery—have reasons for its reduced Phase I contract income. It would also mean to go without trying to get a contract to compete with a requirement for performance, as narrow manufacturer would thereby eliminate possibility of getting work a major headache in the form of a task that can't produce when the design

is done or a question that can't serve as product in the field—except the least possible.

Certainly development contracts, rather than general design contracts, would achieve the same results as equipment and services put in the field. As in the building of fighters, bombers and transports, supplier specialization favorably fits the field on the to receive a contract. It is shared by those persons that—to save money and manpower—like Robert's and is rapidly doing a better job of it.

But it is not as if there should be no competition. No one doubts the value of prices in the struggle to make a worthy civil. As a matter of fact the competition, although somewhat risky, would be considerably healthier.

For a market such as the development of special aircraft to firms with specific skills, but only would it permit the considerable waste of engineering resources on projects that are particularly desired—but which may be sought to maintain economic levels—in a world where such projects are often concerned and spread the business gradually on a great piece of efficiency.

For performance in place of paper proposals can be well as the alternative old in development leads to the supply industry in it will be the group in aircraft production. Multiple suppliers, it is sufficient to build it as it is the other, but you'll find the system supply houses themselves have long been placing important contracts only with issues of general reliability.

If the price plan does extend the Air Force plan to the supplier, it could be the whole program will have a good part of the efficiency it's now expected to achieve.

It's something to think about.



SCOOTER and. Close deep capsule.



PROPOSAL for capsule and propeller.

"Equipment we have should be evaluated on a very long range basis—we can't reproduce another species of man," he says. First objective is to improve escape means should be to determine limits of human tolerance and the margin of survival beyond the point through aerial experimentation, step closed.

Human Level

Second line of attack, he said, consists of designing equipment with controlled performance under all expected conditions of escape to modify and control the limits to tolerable human levels. An essential specific problem, he added, is the full scale determination of lift and drag at the coast-out combination of all modes of penetration by means of wind tunnel experiments up to Mach 2 at sea level.

A man should be used in the tunnel tests up to Mach 1.1, after which a slender duplicate could be used up to Mach 2, he said.

A re-examination of human tolerance in both upward and downward egress, using additional pilot support (aircraft) in long range, deep, and the reported that these have been two upward egress at about 500 ft. at 15G without injuries. One approach for solving the problem of wind drag distribution is to apply wind tunnel data using egress in a counter force using a propulsive mass, he said.

Northrop Aircraft's George Nichols told the meeting that the escape problem may be solved now in further low level in the efficiency of the escape system. As a working agreement in design of a new aircraft would be to bring in opinions escape factors and then compromise other conditions around them, he said.

new Boeing jet tanker to stretch America's Air Arm with mid-air refueling

Almost daily, continuous flights halfway around the world are being made because huge KC-97 tankers meet bombers for refueling in mid-air. Tankers like the Boeing KC-135 will bring "bombers" on anyway. Continents within striking distance. The new Boeing KC-135 will land extra large engines because added strength with less weight is possible with metal honeycomb construction. Kawneer is helping build more planes like the KC-135 faster because of excellent metal bonding facilities to produce any kind of honeycomb assembly. Our experience in metal bonding honeycombs will be helpful to you in designing new applications of this material. This is another example of how you can benefit by Kawneer's integrated engineering and manufacturing service.

Kawneer will produce the interior for the KC-135 utilizing honeycomb as structural construction.

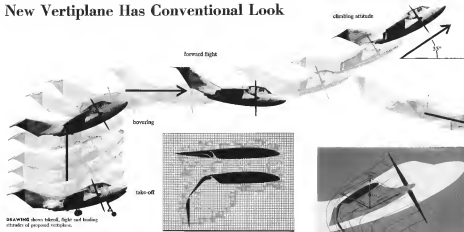
Diagram here is the Boeing KC-135A, prototype of the new KC-135.

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New Vertiplane Has Conventional Look



DRAWING shows take-off, flight and landing attitudes of proposed craft.

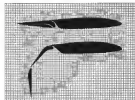
hovering

take-off

forward flight

climbing attitude

35°



NEW FLAP: Closed and dropped for hover.

Double Flaps Give Weber Model Vertical Takeoff Ability

By William J. Coughlin

Bethlehem, Calif.—Weber Aircraft Corp. is flight-testing a powered model of a new vertical wing aircraft, conventional in appearance but capable of taking off and landing with zero forward speed.

The firm hopes to integrate the technology in design and construction of a low-cost research airplane for full-scale flight testing. Preliminary evaluation by Wright Air Development Center has indicated that both the concept and proposed are "feasible."

Designer of the new aircraft is Joseph L. Volanquez, former project engineer on Pterodactyl 14-16 helicopter and now chief engineer of airplane projects at Weber.

Weber's design was evolved from basic research done by the National Advisory Committee of Aeronautics,

Charles H. Zimmerman, Louis Bragard and others.

The Weber aircraft is a conventional forward-wing aircraft with helicopter wings. To achieve its vertical wing and hovering capabilities, the design employs extended double flaps to deflect the propeller streamlines from horizontal to vertical.

Aerodynamic Theory

"The aerodynamic theory is not new but recent developments make this type of aircraft possible," Volanquez points out. "These developments include air-craft turbine engines and controls."

But the key to the Weber design is found in NACA Technical Note 3116 which indicates that all that is required to produce vertical lift without a horizontal component is to impart a sufficient downward acceleration to a sufficient mass of air.

Helicopters achieve this by imparting a relatively low velocity to a large mass of air. Examples such as the Comair and Lockheed vertical wing fighters accomplish it by imparting a relatively high velocity to a smaller mass of air.

Volanquez points out that it is not necessary for the thrust line of the propeller axis to be in a vertical direction to produce the downward acceleration of air. He contends that the same result can be obtained by redirecting the airstream by means of a wing and flaps. Although the wing, engine and propellers remain in a conventional attitude, the flap arrangement will produce a purely vertical force on the aircraft, according to the Weber designer.

He cites recent NACA wind tunnel tests which show that it is possible to obtain a change in direction of the propeller thrust by as much as 75 deg with only 10% loss of magnitude.

One difficulty in the past has been that the large degree of flap required to seek an effect produces an uncontrollable nose-down pitching moment. However, the surface, ineffective at zero speed, cannot cause this out.

The answer to the pitching moment problem is the heart of the Weber design. The solution offered is placement of the propeller shaft low below the accommodation corner of the wing. This downward displacement of the thrust line combines with wing lift, drag and pitching moment to act through the aircraft's center of gravity.

"Pitching equilibrium then results about the airplane's center of gravity," Volanquez says. "Under such conditions, the nose-down pitching moment resulting from curvature of the flaps is balanced by the nose-up pitching moment introduced by the propeller thrust."

To reduce one of the initial airplane design complexities that is a two-place aircraft, he concentrated into a single-plane research aircraft to test the theory involved. After each flight testing, a stripped-down configuration which would not have canopy, fuselage or retractable gear, the aircraft would be completed prior to its final flight test wing.

The WV-1 would have a 30 ft. wing span, 70 ft. fuselage and a design landing weight of 2,500 lb. with a useful load of 1,000 lb. It would be powered by a Continental T40 helicopter engine, the G-5 version of the Lycoming Aircoast II rated at 425 hp.

Volanquez says the WV-1 flight test program would seek solutions to these problems:

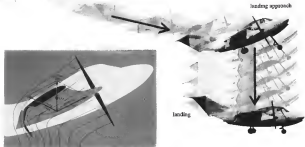
- Amount of hovering during transition due to stalled portions of the wing not connected in the propeller slipstream

- Trim changes due to ground effect.
- Possible dynamic instability in hovering or transition.
- Possible propeller vibration during transition due to high angle of attack.
- Effect of ground cushioning.
- Deviations from NACA test data.

NACA Wind Tunnel Tests

Studies leading to this design were largely finished several years ago when NACA conducted wind tunnel tests on the prototype model. This was supported by Volanquez in his design theories.

It is only now, thus, that results were made available that it has become possible to design a hovering airplane with accuracy, predictable hovering performance including power required and hovering attitude, says the Weber designer. It was after this information was made public that the WV-1 evolved from a variable-incidence wing design



landing approach

landing

SCHEMATIC of airplane over wing and flap causing vertical lift.



research*

development

design

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Typical of the types of projects Hoffman Field Engineers are working on, one group is presently engaged in conducting field evaluation studies at various air bases on TACAN, the most advanced airborne navigation equipment yet produced. This field study is being coordinated with Hoffman's production of TACAN equipment.



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EDMUNDO VELAZQUEZ in control chair...



With his vertiplane model through parts. Note extended flaps for hovering.



WEHR VERTIPLANE model barely just off ground in steep climb; wing flaps fully extended.



Then, at Velazquez's command, the model climbs for steep attitude to revert to normal flight attitude.

conceived earlier by Velazquez.

WV-1 is designed for climb, hovering and landing in a 25-deg nose-up attitude. "It appears that the best design compromise is a... where the landing attitude nose-up angle is at the same order of magnitude as for ground air, wingtip, or delta-wing lighter aircraft," says the designer.

Flight testing of a gas-turbine-powered one-third scale model was a matter of a few days at the company's Burbank plant. The test rig employs an operator's seat with a free-rotating helicopter-type arm extending out to the model, which is free to move in a circular path or to rise and descend vertically.

The two-engine wooden model employs double flaps in its only movable control surfaces. Angle of attack is controlled by movement of the starboard and engine power is adjusted by a

control on the operator's chair.

"The model is pointing out one thing," Velazquez reports.

Transition to Horizontal

Horizontal flight characteristics of the WV-1 are expected to be those obtained with the conventional elevator, aileron and rudder control surfaces which it employs. Vertical takeoff and transition to horizontal flight would be accomplished in this sequence. Nose gear would be extended to bring the aircraft from its level ground attitude to takeoff angle of about 25 deg. Increase in power and back angle of the constant-speed propeller would lift the aircraft into hovering flight.

The nose could be lowered to cruising or climb attitude for forward flight as flaps retracted into their position as trailing edges of the straight wing.

Landing procedure would be somewhat similar to a para-jumper's corner landing. Wings would extend gradually as power was added, nose tilted and speed reduced. After a low-high, steep-speed hovering condition was selected, descent would be made by a slight decrease in power.

In the steep-speed hovering condition, roll would be controlled by cyclic deflection, either through power changes or change in blade angle, yaw by differential use of flaps, and pitch by simultaneous flap changes. Control surface stick and rudder movements would be required for all three, as an inherently complex control system.

Air Support Vehicle

Charles L. Buckley, vice president of Weber Technologies, would be confident using actually would be confident



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FRONT VIEW of rotor hub shows how shafts fit in around rotor mast.

for logistic and tactical air support, combining the range, speed and reliability of a conventional aircraft with the vertical characteristics of a helicopter.

Although Weber studies indicate that such an aircraft would have problems below those of a comparable helicopter, the rate of progress could be much higher due to cruising speeds greater than those of the helicopter. When operating where rivers were a liability, as pointed out by Weber, increased by conventional horizontal takeoffs.

The ability to make other horizontal or vertical takeoffs would be a great advantage on a full range vertical takeoff aircraft, Becker notes.

On longer missions, the Weber VRA could make a beach landing horizontal takeoff and then land vertically on a combat area after using its full weight in return.

The VV-4 cargo version would have a top speed of 452 knots cruise at 341 knots and have an effective range of 1,020 nautical miles at full payload according to Weber calculations. Conventional takeoff might permit gross weight to climb from 41,000 to 70,000 lb.

Becker believes the cost of use of the VV series should not be more than that of a helicopter of the same gross weight.

Weber's Work

Weber Aircraft Corp., with a plant area of 170,727 sq ft, presently designs and manufactures aircraft systems equipment as well as doing subcontract work on major airborne components. Weber operates units and used on the Boeing B-47 and B-52, C-119, C-119B, C-119C, C-119D and C-119E.

During World War II, the firm's facilities were used for fabrication and final assembly of more than 40 P-51

aircraft and over 600 Lockheed Lodestar.

A separate engineering division was set up at Weber two years ago for research and development in rotor wing aircraft. It was at first time that Weber joined the firm.

The helicopter projects since have been shifted to concentrate on his VRA design.

Whitcomb, after receiving a Master of Science degree in aeronautical engineering from the California Institute of Technology, was employed as structural engineer at the Douglas Aircraft Co. from 1938-1944, served with the Navy Bureau of Aeronautics between 1944-1946, worked as structural engineer at North American Aviation 1946-1948, and joined Perceps in 1949. He came to Weber as chief engineer, the prime project, in May of last year.

Prefab Helicopters

Members of all steel prefabricated Helicopters, has been announced by Decca Corp., Perthshire.

The Helicopters consist of structurally supported sections of open steel girding which serve as landing and takeoff pads for the helicopter. The open girding provides proper drainage, and carries air, even as it is shown in the photo.

For water-based use, the Helicopters float deck is constructed of 12x40 ft sections with automatic straddling you could be quickly mounted floats which cushion the impact of landings and takeoffs.

The Helicopters platform may be as small as 10 ft by 20 ft or as large as 100 ft by 100 ft. The Helicopters were developed by Standard Helicopters, Inc. Minneapolis under whose license, Decca will operate.

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ROCKET MOTORS for Viking are checked in big stand overlooking RMI test area.

Navy & Reaction Motors Open \$4-Million Rocket Engine Facility

By Henry Lester

Denville, N. J.—The U. S. Navy and the nation's oldest rocket engine company formally opened a 4-million rocket engine development and production facility within the month here as the sailing bells of southern New Jersey.

Built under the auspices of Reaction Motors, Inc., and the Navy, the plant consolidates within 750,000 sq ft of working area RMI's administrative offices, research, engineering and manufacturing operations that previously had been divided between Rockaway and Lake Denmark, N. J.

The company is entering the last of its Rockaway plant history, for one is special projects. In addition, new administrative, test and engine

research and experimental—in a 31 acre site. It was laid out with a view of achieving the most efficient communication between related departments and with an eye towards future expansion.

The administration building is located on RMI property and belongs to the company. The foundation of the new facility is on Navy-owned land and is

and research and experimental—in a 31 acre site. It was laid out with a view of achieving the most efficient communication between related departments and with an eye towards future expansion.

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The administration building is located on RMI property and belongs to the company. The foundation of the new facility is on Navy-owned land and is

erected by RMI under a Navy facilities contract as part of the Naval Air Station Base.

The 66,000 sq ft engineering and research building contains laboratories design department, project and planning offices, a library and records section. One wing is devoted to chemical and physical research. There are nine chemical laboratories, controlled humidity areas and much special equipment necessary for rocket research. The building also includes a large physics lab, a hydrostatic lab and an acoustics lab.

The 67,000 sq ft experimental shop building contains production, fabrication, component and tool inspection departments.

In pushing rocket development to new frontiers, Reaction Motors is working with new propellants being developed by its parent company, Olden Chemical Corp. RMI, in conjunction with Olden Chemical and Massachusetts Aircraft Co. (in which Olden Chemical has an interest), recently formed the OSMAR group for cooperative research on propulsion and associated problems (AW Aug 22 p. 56).

The company has not been tipped by the Independent Geophysical Year space satellite program, according to Kenneth W. Young, RMI president, but expects to be asked to bid on the powerplants for the second or later propulsion stages when the prime contractor's design is further advanced. General Electric has the task of developing the engine for the first stage.

The main emphasis at RMI is on liquid propellant rockets, such as the 3,000 lb thrust unit that powered the Bell X-1 and Douglas Skyrocket research aircraft and the 20,000-lb motor that blasted the Martin Viking to an altitude record of 150 miles in 1953. Other developments include the R-400 liquid motor's tests, installed on helicopter rotor tips for auxiliary thrust (AW Sept 17, 1954, p. 17).

These motors weigh 1 lb each and produce 32 lb. of thrust. In the late



VIEW OF LAKE DENMARK SITE shows more of RMI's test stand, liquid oxygen tank.

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In building J44-1, the Fairchild powerplant for the subsonic
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Chosen for Dependability in Any Environment

In today's modern aircraft, many "doors" stay open when closures are properly "latched up" for high speed flying. This Hermeti-Seal Door Lock Indicator Switch is a typical example. It remains latched after door closure, light as evidence on the instrument panel when doors are securely latched, and "lives out" the door rotor.

To match the all-weather, all-temperature performance of the aircraft it serves, the switch is hermetically-sealed. Both electrical and mechanical parts are sealed in a die-cast metal for dependable operation in any environment. Temperature cycling can't cause confusion inside the case, the switch can't freeze.

Selector of moisture is sealed out. Hermetically sealing protects the switch from dirt, corrosive atmospheres, oil intrusion, impact and overpressure.

Construction means corrosion from -100° F to +250° F. The unique spring action means operation dependability even when the outside case is covered with ice.

It's little wonder that Hermeti-Seal Hermetically-Sealed Limit Switches are first choice on so many modern aircraft—for all kinds of switching jobs where dependability is a "must". For complete details about the many types available, see our catalog or direct and send us a description of your requirements.

Multiple types, models also available

ELECTRO-SNAP SWITCH AND MFG. CO.
4108 W. 14th St. • Chicago 24, Ill.

Write for Data
Sheet ES-19



Break-For-Switch
One of the three variations of the Electro-Snap Switch.
Flip-Switch
When flip, closes and also operates indicator, switch of differential pressure, fuel W. any, 250 DC circuit.
Lever Switch
New model is today's newest. Signals for indicator and an alarm circuit in control room.
Red-Tech Switch
First differential type design hermetically sealed for use in rocket. For Air Force testing aircraft.
Seal Switch
Heavy armor plate, long and 1/2 inch, flexibility in mounting. Controls main pump, hydraulic unit.



New Hermeti-Seal Hermetically-Sealed Switches control landing gear doors of the B-36. All four-engine B-36s.



Denmark test area, RMI maintains two test test rig—a looped ring and a looped ring capable of turning at 1000 rpm.

RMI Test Stands

In the test there are two main stands capable of taking large and small rocket motors as well as automatic storage facilities, including tanks for liquid oxygen resources and stored. On a full scale stand the test area is the 150,000 lb thrust stand on which the Viking engines were tested. RMI on ground in the stand could actually take 1 million lb thrust, but no motor of thrust that size has been tested here then for. The largest test stand has developed 120,000 lb, and about 75 tons have been made of 50,000 lb.

The company is working on application of rocket to liquid-propellant power guns, jet deflection, rocket propulsion and launchers, and boundary layer control. The company is also investigating the possibility of manufacturing industrial elements as products of rocket construction.

RMI's Future

Reactor Motor was founded in 1941 to test rockets of the American Rocket Society. James H. Wadsworth, one of the founders, produced the first design in this country for a fully reusable test rocket motor, based on the liquid

propellant rockets. In this type of design, the propellant flow is a jet surrounding the combustion chamber, thus cooling the chamber while it itself is warmed. The Germans developed the principle independently at about the same time in 1940.

RMI's present activities embrace both military power contracts and industry subcontracts for specific types of related aircraft or guided missiles. The company is working on short-term contracts, being told American V-2s.

A tour of the new facilities showed many active studies tests which rendered into production activity at present. However, complete efforts of RMI is headed for its biggest year yet. Orders for new launches tested over 50 engines in 1954 and will go higher this year, with a backlog indicating even greater growth in 1955. Present employment is over 500.

Plant Completed

The final piece of production equipment has been installed in the Trevelyan Building, Co.'s laboratory-like plant in New Philadelphia, Ohio. Trevelyan claims that the facility, as the old one is the world devoted to the production of tapered roller bearings in substantial quantities which are held to tolerances of 75

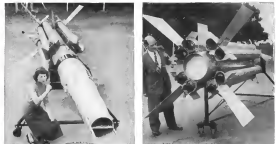
millionths of an inch. Components of the bearing have to be accurate to 1/100,000th of an inch to make up a bearing whose output is accurate to 1/100,000th.

NAA Subcontracts Total \$172 Million

North American Aviation, Inc., awarded subcontracts for more than \$172 million during the first half of 1955 for the manufacture of parts and assemblies for the F-100 Super Sabre, F-86 Sabre, F-105F Navy Mustang, F-73 and F-74 Javelin.

The largest single contract, approximately \$3 million, was given to Chance Vought Aircraft, Inc., for fabrication of the rear fuselage for the F-100. Other Super Sabre subcontracts include Alamo Manufacturing Co., \$6 million; Northrup Aircraft, Inc., two contracts totaling \$1,400,000; Goodrich Aircraft Corp., \$800,000; and General Motors Corp., \$700,000.

Contracts for components of the F-100 trainer, F-86, F-73 and F-74, included \$5 million to Seeger Refrigerator Co., \$3,900,000 to Ross Aircraft, Inc. More than 60 other companies were given contracts ranging from \$100,000 to more than \$500,000.



Britain's Napier Ramjet

Napier ramjet test vehicle is designed for low supersonic speed range and is heated by a shock of single solid propellant rockets with offset nozzle. Ramjet is attached to test vehicle with the offset nozzle provide convenient separation just before burnout. They in minute immediately ahead of ramjet, a non-use for ramjet-driven test plane. Despite the velocity range and reducing the performance data, ramjet is made in at least six locations. Note the unusual shape of vertical air intake between ramjet, the shock of the ramjet exhausts from and to tip.



BUCKET BRIGADE

Jet impower in the backbone of Austenal's defense, and jet engines depend upon accurately cast turbine cases, turbine blades and supercharger buckets for power and performance.

To manufacture these vital precision parts, Austenal applies the ancient "lost wax" method of investment casting, greatly improved and now called Microcast—a technique so precise and so accurate that Austenal turbine buckets and more efficient costly machining and require only a minimum of finishing.

The Microcast process was developed by Austenal, and its versatile manufacture of steel jet components is only one of many applications. In every field of industry, Microcast is proving that complex, intricate metallic parts can be made better and more economically by investment casting.

Let Austenal show you how Microcast can help lighten your production program.

Write today for Austenal's informative booklet, "Design with Microcast to Build."

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PRODUCTION BRIEFING

► Associated Spring Corporation's Enrol divisions, which suffered several hundred thousand dollars worth of damage from the floods which devastated large areas in Connecticut, recovered its customers that automobiles in Germany would be minor. None of the divisions' processing equipment suffered major damage.

► Torrington Co. has moved its New York offices to the Port of New York Authority Bldg., 111 Eighth Avenue.

► A new welding process has been developed and patented by Trust Tube Co., E. Troy, Wis., to manufacture welded stainless steel and high alloy tubing and pipe. The company is vying for the role of the continuous roll and welded the formed tubing from the outside, permitting greater to eliminate the weld bead on the inside diameter of the tubing. Even in the unrolled condition, the tube has a smooth and flawless interior surface, the firm reports. Trust Tube is now able to produce full finished tubing and pipe sizes in the various Hastelloy grades, Zirconium, Zirconium, titanium, and 19-9 EL.

► Engyne X-Ray and Metal Testing Laboratory, New Canaan, L. I., N. Y., is constructing a test cell capable of sustaining variable changes of a vertical speed of more than 1,200 mph with thermal changes of more than 100° per second for high performance tests of rocket-powered missiles and flight components.

► E. M. Hollingshead Corp. has opened a new manufacturing and distribution center in Bensenville, Calif., as its Western Division headquarters. The plant is equipped to turn out maintenance chemical compounds at an annual rate of 1.5 million gallons.



OCTOPUS GRIP VACUUM CHUCK can reproducibly hold intricate castings with variable surface geometries to hold them and pattern during milling operations. A stress on the center hole serves as a shock-off point allowing any shape due to be placed on chuck without complicated sub-assembly. Various sizes developed by Corcoran and manufactured by Posson Tool Engineering, Inc., El Segundo, Calif.



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... Skill and know-how on the part of designers and fabricators of transparent enclosures.

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The proper maintenance of transparent enclosures requires:

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As the manufacturer of America's standard transparent plastic, we will be glad to supply detailed information on the care and maintenance of PLEXIGLAS "Types of Flight," a 30-minute film training film on this subject, produced for the aircraft services, is available from Rohm & Haas Company and CAA film libraries.

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AVIONICS



SILICON RECTIFIERS (above) are key to new a.c. to d.c. converter.



POWER PACK (above) uses magnetic amplifier to regulate output.

Silicon Rectifiers Lighten Power Pack

By Philip J. Kline

A new lightweight a.c. to d.c. converter one-third lighter than—and requiring only one half the space—of its predecessor, will be introduced this week by Westinghouse Electric Corp.

The new 200-amp. power pack converts engine-generated 200- to 400-cyclic power into 28-v. d.c., regulated to within one volt, and is capable of operating at ambient temperatures up to 120°C.

The first public showing will be at Los Angeles in the exhibit of the Air and Astronautics Society, a group which concerns itself with aircraft power generation and distribution system. The exhibit is being held in conjunction with a technical conference sponsored by the Air Transportation Committee of the American Institute of Electrical Engineers.

Silicon Rectifiers

The new Westinghouse power pack, ATR 200A, even at 15 lb. weight, high temperature and shock-resistance capabilities to the use of new, high-power silicon rectifiers in combination with a two-stage magnetic amplifier voltage regulator.

This made use of the first electronic applications of the high-power silicon rectifier.

In addition to cutting weight and saving temperature limits, silicon rectifiers offer other important advantages over the previously available semiconductor. They include:

- Long life without deterioration of

characteristics with age.

- Greater efficiency, cutting power losses and saving cooling needs.

- Very low (reverse) leakage, an important factor when used in low-loss applications.
- Hermetically sealed, making them environment resistant.

Power Pack Performance

Operating from engine-generated three-phase a.c. power, the new ATR 200A is designed to operate from an input of 200 volts $\pm 5\%$, 400 cps $\pm 5\%$. Under this condition, Westinghouse says the unit provides:

- Voltage regulation to within 1 volt.
- Recovery time of less than 0.2 sec.
- Ripple of less than 1 volt.

The unit operates satisfactorily when input voltage or frequency vary as much as 10% from nominal, showing only slight degradation of regulation.

Voltage regulation is accomplished

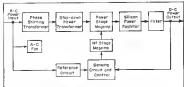
by a two-stage magnetic amplifier, which compares the output of the power pack with a 25-v. reference voltage obtained from a VR tube (see block diagram, below).

The mag. amplifiers are wound with silver-plated wire and are designed for 1,000 hours life at ambient temperatures up to 120°C. Westinghouse says.

Two or more of the Westinghouse units can be operated in parallel to supply a common load. Under these conditions, load will be divided equally among the several units to within 1.5%, according to E. G. Austin, of the company's Aircraft Equipment Department, which developed the new unit.

Overall Characteristics

When input voltage is 280 and the frequency 400 cps, the overall characteristics of the single power pack



BLOCK DIAGRAM of new Westinghouse voltage-regulated a.c. to d.c. converter.

Cline Electric

HELPS OLD MOTHER HEN
GATHER HER CHICKENS



See us at AIAA/FAA/IEEE-88

Take a squadron of planes into the air from a floating carrier base—those the planes around the vast ocean sky at speeds some times faster than sound! While her chickens have scrambled, put old mother hen, herself, through violent tactical maneuvers. After an hour or two, bring them all back together again from hundreds of miles apart.

This is routine for the men, planes and ships of the U. S. Navy's "Hawkeye" force.

And Cline Electric, a leading manufacturer of shipboard and aircraft controls, and other electrical apparatus, is playing a vital role in helping make it all possible. We're proud of our assignments!

Private industry, too, can depend on Cline as a supplier of efficient electrical equipment.

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3446 West 47th St., Chicago 32, Illinois

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reach or exceed those of the d.c. generator it replaces, according to Airbus. For example, the unit can sustain the following reported electrical loads at rated input voltage and frequency, for seven hours:

- 150% load for five minutes, followed by 50% load for 10 minutes
- 210% load for one minute, followed by 50% load for 10 minutes

Weight Saving

Making allowances for the increased alternator (d.c. generator) capacity required, plus associated cables and controls, the new 520-amp power pack weighs 63 lb. This compares with a figure of 91 lb. for previous available static power packs and 71 lb. for the equivalent d.c. generator (and associated) it replaces. The new AIR, 2085, occupies a volume of 1,650 cu. in., about half the size of previous static power packs of comparable rating which occupied about 3,000 cu. in.

Westinghouse is developing a line of both ac-powered and integrated d.c. power packs, rated for 50, 100 and 180 amp. The weights of these units are as follows:

- 200-amp: 55 lb., regulated, 36 lb., unregulated
- 360-amp: 76 lb., regulated, 37 lb., unregulated
- 500-amp: 22 lb., regulated, 14 lb., unregulated

All units are cooled by an a.c. motor-driven fan.

Teeling for Production

Although flight tests are not scheduled to begin until early 1979, the results



Tube Cooler

New heat-dissipating tube cooler can be substituted directly for JAN type shell without modification of existing equipment. Series TR is a modification of an earlier heat-dissipating shell which required a special base. New version reportedly dissipates half the heat, at such as 100° and that achieved with JAN shells, and fits standard 7- and 9-pin connector sockets.

Manufactured International Electronic Research Corp., 177 West Magnolia Blvd., Burbank, Calif.

of present non-integrated tests (altitude, temperature, humidity) and. Writing these efforts to believe no more pack tests will turn up. As a result the company is starting to build up its production. Pilot quantities should be available by the end of the year with large-scale production available early in 1978.

Full application data on the new power pack appears in Westinghouse Product Spec. No. 41-4744-Z, available from the company's Aircraft Equipment Dept., Lima, Ohio.

FILTER CENTER

Go East, Young Man—West Coast sources from that plus air clouds to attract customers are getting a dose of their own moisture from General Electric. A recent GE ad in a Los Angeles paper reads: "Come Back East. Join the trek back to the Midwest. Values where there are four seasons of the year. Are you too busy listening for the green 14th of August?"

Airbus Power Conference—Representatives of Embraer, National Northwest, Pan Am and United Air Lines attended a recent Westinghouse-sponsored trade conference at Lima, Ohio. To represent themselves with a.c. power generators and distribution systems which can replace the long used 25-v. d.c. systems in new jet liners.

New Fuel Warning Gauge—New version of Minneapolis-Bloomington's transistorized fuel gauge for the General Electric T11E-1 has a built-in warning system to show whether the distribution of fuel between tanks is satisfactory. The M-B device requires a separate system which remotely shifts fuel between tanks to maintain proper aircraft CG location. The M-B version automatically compares amount of fuel in forward and aft tanks and indicates whether fuel balance is "safe" or "unsafe," in addition to indicating total fuel in both tanks.

A Lot of Plated Wiring—General Electric expects to produce 1 million sq. ft. of plated wiring boards in 1976, representing a total of 1.6 million sq. ft. of plated boards. This output will come from GE's such as 180,000 sq. ft. plant in Auburn, N.Y., which a spokesman calls "probably the world's most completely mechanized plated wiring board production line."

Reliability Report—Aeronautical Research Inc.'s "Control Report No. 1" is a collection of General Tube Reliability in Military Applications" (AW Apr. 3, p. 1741). It has been placed in the Defense Department's Selected List of



Next time the money asks if you're still your life insurance, tell you're so satisfied to a **LEAR AIRCO** you can both enjoy the money.

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Provides a 3' by 47" safety steel platform with guard rails to assist the plant operator for easy and freedom of movement. Easily adjusted by one man, lockable lift operation. No electrical attachments available for motorized lowering. Capacity 500 lbs. Model 124 carries more than 7' in 7' Model 125 service range 7' to 12'.

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McDonnell F2H Banshee refueling from NORTH AMERICAN A-1 Skyraider tanker. Both equipped with Probe and Drogue system.

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110dd, and in standard working voltages of 1, 3, 6, 18, 32 and 15 v. Maximum operating temperature is 85C, limiting their use in airborne equipment. Engineering Bulletin 120 gives application details. Spence Electronic Co., Technical Literature Section, 327 Marshall St., North Haven, Conn.

Masterac d.c. servo motor, Cat. 388715017, designed for airborne use, is available with differentially wound or straight shunt field. Motor is rated at 0.082 hp at 6,500 rpm, and draws 8.8 amp from a 28v d.c. supply. Motor can be geared to provide output speeds as low as 150 rpm. General Electric Co., Specialty Component Motor Dept., Ft. Wayne, Ind.

Rotor generators with 100% rotation in advance fixed are available in a new line which offers choice of angular resolutions up to 32° per cm² sec. Driving rotors can be d.c. or line motor or go governed induction type. Maximum torque is 21 in.-lbs. at 41 rev./sec. at damping resistance is offered. General Electric Co., Raleigh, N. C.

Constant-speed alternator drive for 20 kw machines weighs only 56 lb., approximately 20 lb. lighter than other constant-speed drives of the same rating, according to manufacturer. Unit maintains constant output speed of 3,000 rpm for input speeds of 3,000 to 5,000 rpm, and has a continuous rating of 72 hp., with a higher short-term rating. Speed control is maintained within 1%, or better if required. General Electric Co., Armature & Drivetrain Systems Div., Schenectady, N. Y.

Laboratory Equipment

Audio frequency sine analyzer, Type FE-NA, includes analyzer, and two-microsecond sine automatic and manual analysis of vibration and noise levels. Unit offers a choice of logarithmic or linear scale and has a 5-inch scale chart. Sensitivity is adjustable between 1 microvolt and 100 volts. Drive also offers choice of square (10 cps) or sine-wave (200 cps) waveforms. Federal Telephone & Radio Co., Instrument Div., 190 Kingsland Road, Clifton, N. J.

High-voltage power supply, delivers 100 to 5,00 v.d.c., with 5 amp at 5,000 v. Regulation is 6% or better, no load to full load, and with line variation of 10% to 130 volts. Response time is quoted at 5 milliseconds from 1 kv. to 5 kv., with ripple at 0.05% and stability at 0.25%. Multi-tap pot permits extensive degree of control on output voltage. Northwest Associates, 57-16 126th St., Richmond Hill 16, N. Y.



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Whether Orenda engines go—during the Sabre 3's and 6's to their NATO mission in Europe or the CF-105 all-weather interception of the RCAF patrolling our Far Northern frontiers—there goes Orenda Service. Technical service support of the highest caliber. Orenda service teams today are stationed in the far Canadian north, in semi-tropical Africa, on RCAF air bases in Europe, in England . . . and soon will be in South Africa

to assist in maintaining the Orenda-powered Sabre 3's recently ordered by the South African Air Force. Trained at Orenda's Milton headquarters, and trained regularly for after-market courses, the skilled engineers, technicians and mechanics who make up Orenda's field service teams are key links in the complex organization charged with the defense of the free world today and for the future.



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Lycoming harnesses the hot breath of a new era

Now, in the lungs of Lycoming's advanced gas turbines developed for the Military—the turbine principle finds new usefulness, this time for helicopters. Employing broad knowledge and bold thinking in aerodynamics, thermodynamics, and metallurgy, scientists of Avco's Lycoming Division have achieved in the T 55 turbine important design advantages: dramatic compactness (never before has 500 H. P. been housed in so little space), versatility in installation and operating characteristics, high efficiency, ruggedness, long life, and low production cost. The T 55, developed in close cooperation with the U. S. Air Force and U. S. Army Transportation Corps for helicopter use, also broadens the benefits of turbine power to fixed wing aircraft and many other mobile and stationary applications. Through advanced turbines—as well as improved reciprocating engines, better components, finer precision parts—Lycoming translates research into practical realities for defense, for peace.

The turbine era is here. A broad variety
of future non-military applications
of gas turbines awaits the ingenuity of industry.
If your plans are in any way linked
to power—turbine or reciprocating—now
is the time to look to Lycoming!
Write us your letterhead to Lycoming,
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Here's a **NEW** concept in airborne switches—
Small . . . completely sealed . . . cylindrical switch
for landing gears, flops and other
exposed locations



• This micro switch "EM" Switch has greater versatility than switches many times its size and weight.

It is one of a new family of MICRO SWITCH precision, non-proof switches which offers aircraft designers unusual flexibility in switches whose elements are completely sealed from effects of atmospheric changes.

The "EM" shown here is composed of two single pole, double throw switching units completely sealed in a housing filled with inert gas under pressure. Six 20-gauge MIL-W-5076 leads, six feet long, are supplied, one from each terminal. These project at a 90 degree angle from the base of the switch. They may be run in any direction by rotating the switch.

These switches are designed for bracket type or through-hole mounting. The plunger operates through a 3/8 x 24 threaded housing one each in length.

For complete information on the new "EM" switches, types of rotary actuators and wiring developments, contact MICRO SWITCH Engineering Service at your nearest branch office. Let them show you the complete MICRO SWITCH line of environmentally-proof and hermetically sealed switches for severe airborne service. You will find that it pays to bring your switch problems to MICRO SWITCH first.

CIRCUIT ARRANGEMENT



• Current is double pole, double throw. The wiring diagram and terminal designation are shown on the side of the switch.

ELECTRICAL RATING

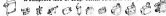
(at 20 volts d.c.)

INrush
Normally-closed, 24 ampere
Normally-open, 24 ampere

AT SEA LEVEL
Resistor, 4 ampere
Inductive, 3 ampere
Motor, 4 ampere

AT 100,000 FEET
Resistor, 4 ampere
Inductive, 2 ampere
Motor, 4 ampere

A complete line of snap-action switches for aircraft



MICRO SWITCH

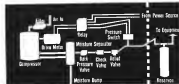
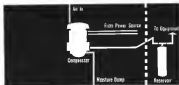
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MICRO SWITCH provides a complete line of snap-action switches, small size, high capacity, snap action precision switches and many switches. Available in a wide variety of sizes, shapes, weights, and in various electrical characteristics. For all types of electrical controls.

EQUIPMENT



COMPACTNESS of new pneumatic package (top) is opposed to rigid systems (see bottom)

Pneumatics Fade, Hydraulics Gain As Supersonic Power Sources

By George L. Christian

Mississippi—The days of high gas use pneumatics as the power source for avionics systems in supersonic jet aircraft appear to be limited.

"More and more, designers are turning to hydraulics."

The change has been recognized—and admitted—by R. T. Cornelius, president of the Cornelius Co., one of the nation's first suppliers of small pneumatic systems. And he has only to point to the century series of fighters to back up his admission.

The successful high-pressure pneumatic systems have been credited entirely to all the carefully-built contemporary—the F-100, F-101, F-102, F-104 and F-105—as well as in the F-4 Phantom II and the B-52 bomber. Even the B-52 has only a small high-pressure system to supply compressed air for next-level gas changing and reduce pneumatic power.

Designs of hydraulic pumps, valves and other components has advanced to the point where Cornelius engineers can

antic hydraulic systems competitive with pneumatic systems from a weight and space standpoint. This, in turn, makes it possible to take advantage of the hydraulic system's ability to supply energy continuously (the pneumatic sys-

tem delivers air only intermittently, because air is normally used faster than pumps can compress it).

Exit Pneumatics

Also, the switch to hydraulics in fighter aircraft is eliminating the need for gas changing, usually done pneumatically. Rocket-breaching is just accomplished electrically.

The complete B-52 avionics system is driven by a pneumatic system, but the pressure is low. Air is bled from the ship's eight turbojet engines. It operates as direct "power packs" which provide all electrical and hydraulic power, even the air conditioning system and water injection pumps of the big bomber.

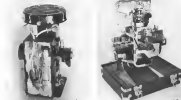
Cornelius, however, has not stood still on pneumatic design. Cornelius developed 1,000-psi packaged pneumatic systems at reduced weight and size are going into several jet fighters and some other piston-powered planes.

Too Many Drive Pads

By using hydraulics, Cornelius believes it will be possible to reduce the number of actuators, which now drive turbojet engines, to only two. Both would be hydraulic pumps, one for power flight controls and the other to drive all accessories through hydraulic transmission.

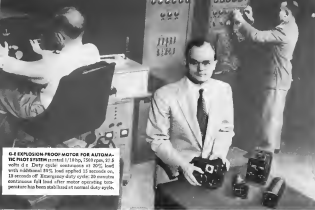
This would cut one of the heaviest components of engine transmission and line, to provide enough drive pads to accommodate the many accessories needed to supply the growing power demands of electrical, hydraulic and pneumatic systems (AW Nov. 9, p. 45).

Cornelius told Avionics World his firm has been working for over a year on



NEW pneumatic package designed by Cornelius

HYDRAULIC components used on F-105, F-104



G-E EXPLOSION-PROOF MOTOR FOR AUTOMATIC PILOT SYSTEM is rated 1/18 hp, 1500 rpm, 27 volts d.c. Duty cycle continuous at 20%; load with additional 85% load applied 15 seconds on, 15 seconds off. Standby duty cycle, 20 minutes continuous full load after motor operating temperature has been stabilized at normal duty cycle.

G-E aircraft motor specialists help solve drive problem on new Collins automatic pilot

E. H. Fritz, Controls Engineer, Collins Radio Co. (pictured above) says, "In the development of a new automatic pilot system, we were faced with an electric-drive problem. When two other suppliers failed to meet our requirements, we called in General Electric."

"In conference with our engineers and G-E aircraft-motor specialists brought in by our local G-E Sales Engineer, we arrived at a solution to our problem. Sample motors were delivered in three weeks, saving us considerable engineering time and expense. We find service like this very valuable," Mr. Fritz concludes.

EXTENSIVE TESTING BACKS SERVICE

When G-E develops a new aircraft or armament motor, extensive environmental testing facilities are

utilized into play. For example, the G-E motor for Collins was subjected to, and passed an insulation test, vibration test, shock test, and an accelerated life test. Such testing assures conformance with your most exacting requirements.

G-E SERVICE FOR YOUR DEVELOPMENT

If you have a development that calls for an aircraft or armament motor, the same fast, effective service provided the Collins Radio Company can be yours from General Electric. Just contact your local G-E Appointments Sales Office early in your planning. Or write giving full details to Section 704-37, General Electric Company, Schenectady, N. Y.



SMALL (1 in. long) Cornelius hydraulic motor operates at 96% efficiency.



SPECIAL portable compressor designed for E.C.A.F. to service hydraulic drills.

a series of hydraulic pumps that are less than half the weight of equivalent capacity pumps now on the market. These pumps are now running at an efficiency of 96%, but subsequent work indicates an expected increase in the figure.

First in the series is a pump which has a displacement of 1 cu. in./rev. The unit, now on test, develops 35 hp, and delivers 6 gpm at 1,500 rpm. The book-displacement version of this new pump weighs 4 lb., the variable-displacement type a 6 lb.—much less than half the 16 lb. of a pump of comparable displacement currently on the market.

The series of pumps, Cornelius has under development ranges in size from 1/16 to 4 cu. in./rev. The company says the price of the lightweight pumps will be competitive with others on the market.

Castor-Built Seals

Cornelius credits the high efficiency of its hydraulic equipment to the fact that the company designs and builds all of its own bearings and shaft seals. Since both types of components are designed for specific applications instead

of coming off the shelf, they are the smallest, lightest stamped units which can do the job.

Over company-developed and, which has been on test for 2,500 hr., has not developed a leak. (Leakage is defined as one evidence of bubbles during a submergence test.)

Whether design refinements which permit the company to extract the utmost efficiency from the pump includes a special very small universal joint to drive the cylinder block. Novel design of the part permits the cylinder block to be considerably smaller in diameter than before.

The block itself is made of hardened

steel, which allows use of much thinner walls than if the block were made of a softer metal such as brass. Seal cylinder block, consequently, allows cylinder ports to be extra large, leading to high pump efficiency. Also cylinder bore is finished to two micro-inches.

High pump efficiency provides a hint how to achieve big drive motor economies. The lower a pump's efficiency, the more heat it rejects into the hydraulic system. The more efficient it is, the more desirable it is for today's broadly "hot" airplanes.

A new Cornelius design concept for hydraulic motors incorporates a method of continuously lubricating the pump's

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5. Outstanding moisture resistance.
6. Viscosity limit allows free potting.
7. Proofer shrinkage.



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giant transport
helicopter has
been an exciting assignment."**

John F. Wren, Senior Assistant Test Engineer

"Working on Piasecki projects like the HO4S has been challenging and rewarding. This, together with good employee benefits and the fact that the plant is located in suburban Philadelphia, where family living conditions are ideal, has made Piasecki the company for me."

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HELICOPTER CORPORATION
MORTON, PENNSYLVANIA

value plane. Blade is a unit which develops high starting torque.

First models have produced starting torques of up to 90% of running torque. Development of the design will lead to pumps with starting torques comparable to those of electric motors—about 200-300%—Cordless products. Weight penalty for this feature will be about 50%.

Packaged Pneumatics

The Cordless packaged pneumatic system keeps into a single and containing the compressor, inlet air filter, starting valve, inlet valve filter, moisture separator with automatic condensation drain and heating element, back pressure valve, check valve, relief valve and pressure switch. Its advantages:

- Seven sizes. The entire air supply system takes up a little more room than the compressor alone in a one-cordless pneumatic system.
- Reduces weight. Up to 5 lb. is saved by eliminating separate system components plus associated tubing, fittings and connections.
- Cuts leakage. Integrated system reduces to a minimum the number of potential leakage sources, such as flared connections and O-ring seals.
- Saves time. Unit can be removed and replaced in a package, eliminating need for replacing several individual components.

The packaged system is powered by a Model 130 compressor rated at 2 cfm, 3,300 psi. Among planes using the system: Grumman F11F-1, Chance Vought F7U-1, North American FJ-2, A-1, McDonnell F2H-1 and F3H, Lockheed P3V, Grumman SIF, Martin F5M.

The systems are available with a c.d., d.e. or hydraulic motor drive.

New Compressors

Cordless has two new air compressors under development. First is a 4-cfm, 3,300-psi unit, which will be approximately the same size and weight lighter than the present 1-cfm Model 130.

Speed and weight savings will be due largely to the new lightweight hydraulic motor which will drive the compressor.

The other new unit will be a Series 1,000-psi air pump whose weight and size have not yet been fully determined.

Another development which the company has completed and delivered to Wright Field is a modification of two Model 130 compressors to deliver 5,000 psi at 1.5 cfm.

The Cordless compressors have few starting friction (they are ball and needle bearings throughout) and many of all parts have been eliminated. The high starting torque of the motor

OUTSTANDING LOAD CAPACITY

EXCEPTIONAL RELIABILITY

Collins

MAGNETIC COMPASS SYSTEM

Combining the high sensitivity of a magnetic coil indicator with rugged, permanent magnets, Collins engineers have developed the MCG-60 system which produces highly accurate heading information. Right panel simplification is obtained by presenting heading on an azimuth ring or RMI card. The Remote Master Heading Indicator is included on the Compass Amplifier. By use of a single control the pilot can select automatic or D/G functions, and can manually correct the D/G left or right.

Plus additional capabilities are available. These instruments in addition to the D/G instrument provide more than adequate system output as well as electrical interface between various heading loads. It can be used with a/D navigational units, like the SIK-3 OBS and OBS instruments, and systems such as Collins IFS and Automatic Pilot. Modular construction, with the advantage of plug-in sub-assemblies, provides the utmost in flexibility and servicing convenience.

Write for MCG-60 literature or contact the Collins Dealer or Sales Office nearest you.

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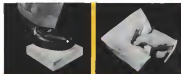
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Resists moisture



Rigid or flexible...as you like

The properties we
own? **Illustrate** are
at least as important
as those we own

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Bonder transmission
Ease of Fabrication
It's "poured-in-place"

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with Light Weight

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allows it to be started the compressor
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it increases to "blew down" the com-
pressor discharge line.

A patented piston ring head design
eliminates side thrust in the piston
ensuring a seal on pistons and cylinders
with.

In the pneumatic component field,
Corneil is marketing a new design in
check valve which will not leak at pres-
sures up to 1,500 psi nor with differ-
ential pressure as low as 0.5 psi. Its
features include:

- **Minimal-to-no dead volume** and combined with rubber-to-metal low pressure seal.
- **Stainless-steel poppet** and "straight-through" air flow providing high flow capacity with minimum pressure drop.
- **Rubber seal** designed to prevent "back leak" during high surge flow conditions. The rubber seal is impervious to compressor lubricating oils.
- **Poppet** being not exposed to or affected by air flowing through valve.
- **Large seating area** allowing valve to function under rising conditions and when exposed to foreign particles in the air flow.

Other Canadian developments are single or dual temperature air brakes which which are in the final, allowing controlled rate of deceleration, control valve drops off the air and locks the brakes.

The Corneil Co. was begun in 1940 when Dick Corneil and his father ("Dad" didn't have a dome between his distorted forehead "pud") was a garage. The peak was all barriers to convert and factories.

When he came back in 1953, the father from gradually shifted into being engineering equipment.

In 1960, the Air Air Corp. headed Corneil as an air compressor made by a large U. S. manufacturer and moved him to build it in quantity for 8-20 psi and for the gas charging. Corneil did not like the compressor's design, so he and his son worked control and built a design. 0-4-0-0, 1,500 psi compressor in 70 days. Since his design was available to design the rest, the Corneil group designed and built a ship motor for the compressor. The motor was built as heavy and much smaller than anything that had been available.

This put Corneil in the motor business, and he has been in it ever since.

During the last war, the company made thousands of compressors for the U. S. Navy at \$100 per piece. "I was for the ship's gas tanks, but for dual bomb bay doors."

The company gradually expanded into the design and manufacture of pneumatic components such as air ho-

ists, pressure regulators, valves and sub-C valves.

When a demand arose for hydraulic motor drive compressors, the company developed its own. One reason why it could remain independent of network suppliers. Another was that the pump had to have a straight through shaft to drive the compressor on one end and a coupling fit in the other, and suitable pump size as the motor were all capital.

The pump was built integrally with the compressor, eliminating weight and space required for mounting flanges.

Compressors for business could not find pneumatic machines needed to do the job they wanted on the pump, so they bought the best available and converted the mechanics to manufacture pump parts the way they wanted them. Corneil develops his pump as a "machanical nightmare."

Among the non-aerospace uses of Corneil's compressors are the service of aircraft landing gear struts, accumulation and emergency in bottles, supplying of air for deaerated type breathing apparatus such as that used by fire fighters and changing, underwater diving equipment.

In 1972, the company moved into a new, 64,000 sq. ft. plant in Monroeville, Pa. Today Corneil employs about 150 persons and does a \$5-million yearly business.



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Fluoroflex-T assemblies solve high temperature hose problem

for Fairchild small jet engine

The feature about small jet engines is the good power-to-weight ratio. One of the first in this field, the Fairchild J-44 turbojet engine now runs trouble-free plumbing that not only saves weight but also withstands the high operating temperatures.

Fluoroflex-T R-3000 hose assemblies were selected to do this job. And for the best reason: they are 300° F lines . . . corrosion-proof . . . with small O.D., extra light weight, and over 2 years of successful experience in service.

Resistoflex is the originator and developer of flexible hose lines using a tube compounded from Teflon* and which have A-30 approval in all cases for synthetic fuels and oils, and nitric acid. Send for Bulletin FH-2

*Fluoroflex is a registered trademark and the product name of the Fluorocarbon Corporation.



RESISTOFLEX Corporation
Bridgewater, N. J.

Light Alerts Pilot Of Power-Line Peril

A warning light that alerts pilots of dangerous power cables will be manufactured by the Avionics Signal Corp., Vancouver, Wash.

Developed under the direction of Prof. H. J. Dana, of the division of industrial research, Institute of Technology at Washington State College, the new light can be positioned on the power line span with a remote-controlled trolley which pushes the light onto the span, clamps it in place, and returns it for removal (ENR Jan. 7, 1952, p. 9).

The light takes its current from the induction field around the power line, eliminating need for connections.

Civil Aeronautics Administration is reported to have approved the device after tests by the National Bureau of Standards.

Fifteen of the experimental lights are being tested, two in Alaska and 13 in the Pacific Northwest.

A modification, in which a booster transformer increases the light's brightness three to four times, adapts it for use during low current. The resulting unit is being tested now near the Pullman-Moscow airport, a few miles from the State College campus.

Ground Broken For TWA Idlewild Base

Plans are being made for a \$12-million hangar facility designed to be one of the heart of Trans World Airlines' new \$15-million Atlantic division transportation base at Idlewild Airport.

The hangar dimensions will allow it to hold 12 Super Constellation aircraft and to accommodate aircraft with tails up to 44 ft high. The structure will be all steel, concrete, design and concrete construction. It will be over 900 ft. long and 400 ft. wide—the width including two 150 ft. aircraft bays and an 80 ft. center section for office and shops.

The 45 ft wide door frames will operate as groups of three, providing open area up to two thirds the length of the hangar.

The parking space of 120 cars, concrete will hold up to 12 Constellation-type aircraft at once. Telephones will be placed at the various aircraft parking areas to allow instructions for pilots to other requests to be called in instead of requiring time-consuming trips to the hangar.

Other buildings on the base will be a commissary and an industrial garage, ground for which has been broken. Completion of the entire base is scheduled.



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And G.L.A. ignition is used on many of the post-war aircraft which hunt the Firebee down!



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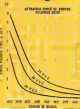
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[illegible]

edited for 1992

The fungus plants are being prepared by Armand & Whitney, New York, and Burns & McDonnell, Kansas City, Mo.

Slick Modernizes Ground Equipment

Stell, Arizona is spending close to \$75,000 on a cage handling improvement program designed partly to replace and partly to supplement personnel.

The freight carrier's program calls for new Clark forklifts, two Ingersoll electric tag boats, four Toltels scales, two baggage carts and three Chevrolet high-lift trucks. The equipment will be located at various Skydrome stations.

The modernization program was begun this summer and is expected to be completed soon.

OFF THE LINE

First commercial carrier to service the BG Corp's new, platinum chloride spark plug is Western Air Lines. Tests ending in November will determine whether the BGWR plug can go a full 1,000 hours without service. WAL's route structure is such that the tests will give good short-run information and some data, according to BG. The plug has a 24-in-20 hermetically sealed "all weather" top, and is approved for



Boasted C-46F

Two Marboort jet engines installed under fuselage of Transair Air Lines C-47F have boosted takeoff payload by 10,000 lb, according to the airline. Experimental ship shows how recently completed a push-to-pull conversion.

installation in all models of Ford & Whitney Aerojet R-4300, R-1500, R-2000 and R-1530 engines. BG says the RE10R has been successfully demonstrated by the Air Force.

All-weather spark plug for executive aircraft seals against moisture, dirt and salt, regardless of altitude. NG Sports Plug, maker of the ISH 36, says dependability of the plug at all altitudes has been proved by millions of hours of flight on military and commercial planes.

TWA is using a standard agitator-type clothes-washing machine as test of a new method of cleaning the disk-type piston cup and strikers installed on all of the airline's engines. Six of the strikers are placed in the machine simultaneously. Detergent cleaner solvent is added and the machine turned on. In five minutes the strikers are clean. Previously it took a half-hour to clean a single striker.

Non-leads-copper strap rolled to .001 in. (0.0025 in. thickness) is used in the pressure-sensitive diaphragm in an acoustic or detection control system. Minute vibrations in pressure on the strap are transmitted to electronic circuitry which amplifies the "danger signal" transmitted by the ultra-sensitive diaphragm. Mids of the strap is American Silver Co., 38-67 Prince St., Flushing, N. Y.

United Air Lines is adding a two-story hangar and new flight kitchen to its Seattle-Tacoma Airport facilities at a cost of over \$1 million.

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CONTENTS: Complaints

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WHAT'S NEW

Telling the Market

Automatic tracking theodolite and data reduction system: Project Digit No. PD-20, Cook Electric Co., 2760 N. Southport Ave., Chicago 14, Ill. Handbook on Bomb Calorimetry and Elemental Analysis, booklet and precision grading and tipping machines, Catalogue No. 1844, Norton Co., Worcester & Mass. . . Remko Engineering Co., International Boulevard Co., 900 N. Broad St., Philadelphia 5, Pa.

"Kel-Ray" projection, gamma ray sources for industrial radiography, booklet, Metal & Thermal Corp., 108 E. 42 St., New York 17, N. Y. . . Well charts: How to Select the Right AN Connector and How to Specify the Complete Connector Assembly, Detroit Co., 7080 Austin Blvd., Los Angeles 5, Calif.

SWA and SMA Push Button Actuators, Data Sheet P90, Applaco, Switches, Data Sheet 100, Mayo Smith, Division of Minneapolis Honeywell Regulator Co., Freport, Ill. Epoxies 4-B and 4-B-2 filled Epoxy Resins, Bulletin EP54-334, 1/2, Epoxies 4-C and 4-D filled Epoxy Resins, Bulletin EP55-61, Union Plastics, Inc., 4516 Broad St., Los Angeles 39, Calif.

Electric heating elements, Publication EC 55, Carter-Managers, Inc., 445 N. 12th St., Milwaukee, Wis. Super 6300 differential pressure switches for control and alarm systems applications, catalog sheet, Southwestern Industries, Inc., 5530 Central Ave., Los Angeles 45, Calif. No. 99 cold-rolled galvanized steel coils for galvalume, bakelite, Electro Engineering Co., 3795 Chestnut Ave., St. Louis 10, Mo.

Special report: Radiant Heating and Snow Melting for Airport Installations, made by Engineering Service Dept., A. M. Bern Co., Pittsburgh, Pa. Electroblast Pq Beams, specifications and applications, Circular No. 95, Vertical Precision Hole Grinder No. 2K, Circular No. 99, Development of Numerical Control, Circular No. 97, New 24-in. Precision Plain Optical Rotary Table, Circular No. 95, 42-in. Precision Plain Rotary Table, Circular No. 94, Part 4, Whetstone, Duncan Niles Research Prod. Co., W. Hartford 1, Conn.

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Backed by the #1 Air Time All-American performance

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GOVERNMENT SPECIFICATION TUBING IN STOCK

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The CAA reports that 800 vital-sign accidents occurred in 1964. Naturally not a single one of these planes was equipped with a LEARN ARCON.

ADDED by an instrument without an instrument rating



DENSITYMETER (left) provides continuous measurement of fuel density and enables ground fueling meter (right) to record fuel delivery directly in pounds. Reverse Corp. of America is developing other analog substitutes for weight-measuring and for aircraft.

Meter Measures Fuel in Pounds

Direct measurement by weight of fuels transferred in scheduling operations on the ground or in-flight will be provided by gravity-measuring systems developed by the Reverse Corporation of America.

The company claims its new equipment, measuring volumetric and density measurements to provide a fuel measurement in pounds, will be:

- Accurate to plus or minus 0.5%, for
- Flow Rates from 210 to 2,500 lb per min.
- Densities from 55 lb per gal to 74 lb per gal, and
- Temperatures from -65 deg. F to plus 140 deg. F

First units now being tested by USAF are for ground handling of fuel. These can be mounted on trucks or fuel handling installations.

The said units are for installation in all-weather refueling equipment. Reverse, also is developing a design for use in aircraft, which will provide the pilot with a direct reading in lb of fuel consumed in flight.

The equipment consists of an accurate but conventional volumetric factor in density factor, a mechanical converter and a standard register. In operation, the volumetric meter drives a piston which is coupled to the converter. At the same time the density meter, called a densimeter, feeds a density factor signal into the converter. The converter automatically multiplies density and volume with the result registered on the counter in pounds.

The equipment characterizes specific sampling and calculations of fuel density

by the direct mechanical measurement of density during actual fuel flow. The Densimeter is a zero-controlled, self-balancing instrument. A movable weight rides on a beam which has a float at its end. The assembly is mounted continuously in a flow of fuel. An hydrostatic meter-driven fuel access automatically punctures and equalizes the weight to balance out the moment resulting from the buoyancy of the float. A gas train transmits the result of the activity as a density measurement to the converter.



Largest Universal Joint

The 14-in. o.d. universal joint is believed by its manufacturers to be the largest ever made. It is used to transmit power at constant velocity from engine to drive shafts on TWA's propeller engine test stands recently installed at the carrier's Kansas City, Kan., overhaul base (AW May 24, p. 45). The joint was designed and built by Reverse Joint Div., Gear Grinding Machine Co., Detroit.

* **TURBOPROP**



* **TURBOJET**



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controls vibration

Effective noise and vibration isolation at the vital link where engine meets airframe is a key to success, quiet flight. LORD bonded-rubber engine mountings have consistently proven their ability to control the engine vibration level effectively in all types of power plants—

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LORD has a 25-year record of supplying the aircraft industry with the best in engine vibration control. For further information on LORD bonded-rubber products, contact the nearest LORD Field Engineer or write the home office, Erie, Pa.



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As is well known, at some rate super sonic speeds, with extreme regularity by far the major component of the total drag, it tends to compress energy continually being propagated away from the aircraft.

Wave-Producing Centres

Consequently, it should be emphasized that the shape of the aircraft tends to attract or disperse body pressure, for some or supersonic speeds it is usually determined by its wave-producing characteristics and tends to a much lesser degree to actual wave reflection.

Therefore, it is the wave-producing character (extension of wave producing area) with planes (transverse to flight) upon which the balancing of the aircraft itself with the ideal prototype is to be determined.

Traditionally, these contour relations are determined from aerodynamic wave relations, while the former are largely proportional to dimensions, even vary with their square. In fact, a corresponding contour pattern is developed in relation of wave energy, as that in the aircraft's tendency the wave energy is dissipated in intensity and only at considerable distance the energy dissipation becomes uniform (which means to be farthest), for instance, while the wave energy emanates from a circular cross-section in all directions, it is larger in the direction of the small area of its wave front.

Lessening the Shock

The propellers in all cases, in particular into the resultant Mach front directly and with best advantage that to complete shock generation. As far as wave resistance is concerned, that means resistance to the best possible extent of body interference shocks due to superposition of waves coming from various parts of the aircraft.

This object is achieved by having the development of the actual wave relation from the body of reference, aerodynamic waves the wave-producing contour aspect rather than upon actual area in the equal body length and orientation of these contours are influenced.

Secondly, the specific higher than zero, the difference would study have to be made for the moment bearing of the Mach waves as, with increasing Mach number, they tend to form a plane to control the shock leads to that the required velocity wave energy rather than at the interface by the air side. However, the taking into account of this tendency appears gradual, only when very high supersonic speeds are concerned.

The actual waves become related into wave complex when reflection of the Mach waves be parts of the aircraft it is to be taken into account.

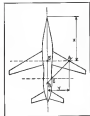
Influence of Sectional Areas

Finally, as regard to the influence of sectional area, it is to be considered that as such displacement relations, which tend to actual wave, are however effective only in different transverse planes and the behavior of the respective plane represents in a known way at the boundary of the concerned section element and of the flight speed.

In other words, such cross reference do

not apply to the wave formation. A point of the aircraft surface cannot arise, as it were, the magnitude of actual area given at the same transverse plane, the Mach front implies of itself a slight reduction of the velocity of aircraft moving with the same speed and in the same direction.

These relations are illustrated by the accompanying sketch and, with regard to the argument to be presented, let it be assumed that in transverse direction there is transmitted through the air body than with wave velocity.



Then, in area element dA at point A, one can see the flow displacement effect on the body surface (shown at point C), which is oriented on line AB, at point B, so located that during the interval in transverse displacement dA in dA (which means B), the aircraft travels the distance AB (at M) or $1/M$ (at B).

The same argument applies to any point of the aircraft surface (in which case of some section area located completely effective). Therefore, also the effect of area tends to phase the concept of the flow, towards that of that indicated by the last rule.

Sketches Procedure

Consequently, the formulae recommended by Mr. Weibull can at best be regarded as a rough approximation.

Again, the use of the diagram of a sign on contour of the sectional aspect, as the wave's position, the actual design process is consequently enough to actual position of the area rule by a sketch procedure, now which takes into account the material of the above stated reference. A graphical method for finding the optimum position could be indicated further.

As the age of through reference up-point to suggesting problems, it appears not only insufficient in only one is relevant, but sources of such total aspect as the design of total surface, where even take into account wave.

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sure build-up from 0 to 50 psig. in less than five minutes. The container will hold a vacuum below 50 microns can strength with liquid oxygen in the tank and has an evaporation rate of 2.5 to 4.5% in vacuum each 24 hours.

Model Lax 150 holds vacuum transferable liquidized gas storage and trans-

fer container, holds 150 gal. or 17,280 cu. ft. of gaseous oxygen at 70F. The unit weighs 890 lb. A pressure of 50 psig. can be built up in less than five minutes. The container has an evaporation rate of less than 2.3% of volume each 24 hours.

Model Lax 500 storage and transfer container for liquid oxygen and nitrogen, weighs 2,540 lb. The tank can be pressurized to 50 psig. in less than five minutes. With liquid oxygen in the tank, the unit maintains a vacuum of less than 15 microns for extended periods of time. The manufacturer reports that models so far have held a vacuum below 5 microns for several months. Guaranteed vacuum loss is less than 15 microns per day. Capacity is 500 gal.

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Russo & Ross, Inc., Orangeburg, N.Y., Marshall, Mich.



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Hudson Manufacturing Co., Inc., Torrington, Conn.

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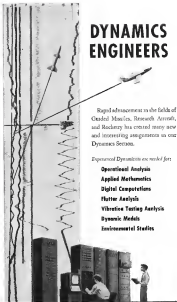


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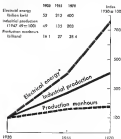
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Power and Production

Much of the basic explanation for the relative expansion of opportunities for those with industrial and professional skills lies in the increasing use of power-driven machinery. This has made possible a vastly greater increase in manufacturing production than in the number of hours devoted to it. The following chart shows the relative increases in electrical energy and number of hours used in manufacturing since 1930 and the rise in industrial production.

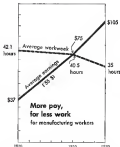


*Excludes power used in domestic and agricultural production. Excludes very heavy power users.

Power-driven machines have reduced the amount of human energy required for physical labor, but they have increased the need for skilled handling and maintenance. As the American MAINTENANCE survey demonstrates, the same is true of automatically controlled machinery.

Higher Wages, More Leisure

The rising average wage of American industrial workers and the decline in hours per week that they must work reflect directly the extent to which the increase in industrial production has outstripped the manhours devoted to it. The first chart shows the increase in weekly wages (in dollars of constant purchasing power) and the decrease in the average workweek in manufacturing since 1930. It also shows the changes that may come in the next 15 years if present trends continue.



More pay,
for less work
for manufacturing workers

There are some who would stop what an earlier editorial in this series characterized as "the continuing process of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control." In doing so, they might make the world safer for those with no skill. The far more constructive course is to welcome the expanding opportunities now being provided and be sure that the nation's young people, who are now starting another school year, are prepared to take advantage of them.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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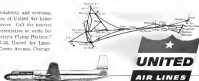
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AIR TRANSPORT

Obsolete Nav Aids Threaten Prosperity

IATA warned that outdated navigation aids jeopardize international airlines' economic future.

By Craig Lewis

New York—Inadequate, outdated navigation aids are costing international airlines heavily and threaten the economic future of the industry, an International Air Transport Association trade technical committee warned here last week.

The state of navigation aids and ground operations on which the airlines depend lays five years behind current needs development, the Technical Committee report before the annual general meeting at IATA declared it added.

"We operate our aircraft with considerably high standards. Refuse them lower than standards, we are often forced to stop enroute possible."

"The magnitude of such possible can become completely intolerable in terms of our future service types if we are without necessary ground operations and navigation aids."

The committee pointed out that IATA member airlines have spent, as plans to spend, billions of dollars in new aircraft orders. (The American World Airways has made the aerial order for U.S. built turbojet transports. Eastern Air Lines and American Airlines have ordered Lockheed Electras and Starliners. European Airlines will order the new Vickers Vanguard in the turboprop field. Scheduled orders for new turbine types are expected from other corners.)

Economic Penalties

These aircraft are "highly sophisticated," the report said, but potentials can operate at lower cost mile costs when laws in the most effective manner technically possible.

"Unfortunately," the report added, "we who have that technical responsibility know that there are very few air, international air routes in the world today where the standard of air navigation facilities and services will permit us to perform our part of the overall operation efficiently and economically."

The committee listed various factors which have an economic penalty on the airlines, including the need for excessive fuel loads, departure delays, slow landing due to inadequate facilities, insufficient lighting or signage

used in uncontrolled situations because of inadequate radio control, inadequate and delayed weather information and inefficient communications.

The committee estimates that one hour of non-productive flying at a modern aircraft costs \$5,000 and points out that, even if new production, (long accounts to no more than 2% of annual utilization), it will cost the airlines millions of dollars.

Greater Losses Predicted

In submitting the report, Raymond Deppe, Air France Vice President and Operations Director and chairman of the IATA Technical Committee, told the meeting that the industry was likely to suffer greater losses than those suffered today because of inadequate facilities and services.

"Without adequate services and facilities," he said, "airline operators will be unable to satisfy the demands of the public for an expanding air transport service, and I know that I speak for the entire IATA Technical Committee when I say we believe the extent of the next five years will confirm our worst fears on the balance sheets of the airlines."

In a review of specific factors involved as an appendix, the committee listed the various air navigation aids and economic penalties from the complexities of international air navigation. A campaign is being planned to bring international aviation law up to date and to keep it in step with technical advances.

An example of backward regulation cited by the committee is the fact that one aircraft requires an airline to carry a radio operator in the cockpit when the radio operator has replaced radio telegraph, and there is no need for the required operator.

'Discount Taxes'

The committee urged the world governments to discount the present air taxes in the United States over taxes and to proceed with development of VOR facilities. It estimated that it will be between 10 and 20 years before VOR facilities will have to be replaced.

The committee pointed out that taxes still has to be passed, operationally and that the system will need

at least a decade of test and development before it can be applied on an international scale.

A growing interest was reported in a relatively new device called Inertial Navigation which is self contained and independent of the ground. The new system was recently released from secrets and is being withheld chiefly because of its potential for use in independent from extensive ground facilities.

In considering efforts to obtain lower operating costs for approach and landing, the committee found that the greatest danger here progressed to the point where inadequate benefits result from improvement of visual aids.

Improvement of threshold and runway lighting is viewed as the most possible goal. It was pointed out that such lighting improvements are also necessary to raise safety standards at current times.

The committee said it is helping the aircraft manufacturers build better landing characteristics into their products in an effort to relieve the pilot during the critical landing period.

Full Control Recommended

Revision of flight rules criteria to bring them up to the standards of today's faster aircraft was discussed by the committee. The group concluded that the alternate solution is to allow the use of all traffic at all times. Since this obviously is not a new idea, the report recommended enlargement of visibility and distance from cloud criteria to allow the pilot of a 300 mph aircraft a theoretical period of 30 ft a minute to see converging aircraft and take action.

The need for strengthening weather procedures is being taken up to the experience of heavy flights was also reported by the committee. An aircraft which can fly 5,000 and 6,000 miles without becoming unreliable, the IATA group said, it will be necessary to change computerized procedures and adapt them to longer range operations.

The committee urged that the International Civil Aviation Organization has completed the Meteorological Annex to the Chicago Convention and calls the matter a vital statement of meteorological needs and obligations which will aid the airlines in getting the services they need from the meteorological community.

In communications, IATA is trying to promote standardization of radio-

telephone procedure, since it has become the accepted medium of communication and "The Morse key of radio telephony is fast becoming obsolete and will soon become a museum item."

The committee said that the electronic equipment carried on radio is not self-sufficient to the work in speed of it, especially in terms of limitations of the number of channels and frequency stability.

It was pointed out that aircraft must have modern equipment in order to take full advantage of ground aids.

The airlines were confused by the committee not to make the mistake of thinking that airborne aids is "the solution of all navigation and safety."

They were advised to stay fully aware of today's limitations but, at the same time, to take full advantage of all effort in increasing passenger comfort and as an additional safeguard and.

It is the hope of the committee that in 1956 ICAO Air Navigation Conference will extend the approval of a "positive" concept to instrument personnel which is now applied to overhead activity. Under the concept, an entire instrument and overhead field will be licensed by a government rather than licensing of individual personnel.

Fuel Restrictions Held

Restrictions of the use of current types of turbine fuel, such as JP-4 and kerosene, for use in turbine aircraft is opposed by the Technical Committee. After a previous study, the committee has concluded that there is not yet sufficient knowledge within the industry to permit accommodation of a single fuel type for civil turbine engines. While it is too early to set specific performance requirements, according to the report, "objective operational requirements" already have been established. The committee said that both engine traffic control, a being developed with the support of the ICAO, including fuelled control over power and emergency for cross traffic and clear limit systems at engine inter-sections.

The committee noted progress in regional activity, especially in Europe, foundation of a radio-telephone high frequency communication system which will allow transmission of Morse telegraphs by next July was cited as an important step in the European region.

It also was reported that the North Atlantic Treaty Organization has set up a coordinating agency for civil and air traffic. Foundation of traffic agreements in trans-Atlantic operations, the report noted that IATA members, an-

nounced and military aircraft made 60,000 crossings in 1954 and will probably make 90,000 crossings in 1955. For the coming year, the Technical Committee will be led by André A. Forster, Vice American vice president,

Fare Dispute, Invitation to Russia Highlight Annual IATA Meeting

A dispute over recent fare increases and requests by Western airlines executives for Russia to lower the fare between were the highlights of last week's trade industry conference of the Soviet Union in IATA. The conference, held at the Waldorf Astoria Hotel in New York, was the first since the war and the first since the war.

In welcoming the delegates on behalf of the United States Government, Civil Aeronautics Board Chairman Ross Barker expressed disappointment over the fare increases. He observed that U.S. domestic carriers are receiving good public response to their new \$160 centimeter fare and predicted that "we will be using existing transaction rights of that rate or less, in high-speed aircraft."

IATA's new president, Juan Trippe of Pan American World Airways, urged Russia to take a careful look at the work done at the Moscow conference before he or the CAB acts on behalf of the U.S. Government.

In his address, Trippe observed that the international airlines on the table means being engaged to implement the "Spirit of Geneva" generated at the Geneva conference of the larger world powers.

Soviet Invited

Although Communist and Polish airlines are IATA members, Trippe noted the absence of a Russian delegation and urged America, the Russian airline, to join the IATA ranks. He said that such a move "would be timely and connecting members on the part of the Soviet Union that they are really willing to lift, in forward level, the line between which has long separated the peoples of the West and the Communist world."

Referring IATA president Max Hahn, president of Air France, told the delegates that the last barrier to international aviation is political—the fare barrier. He called it "a challenge to the wisdom ideal of the first possible coordination of rates and then gradually the concept of the fastest transport by the most direct route which led over

in chessmen, with Capt. A. W. J. Vermaas, vice president of Sabena (Belgian Airlines), and Capt. J. W. G. Jansen, British European Airways flight operations director, in the new vice chairman.

members to cut the perimeter and price the airlines at Rome, France, Kiel and Goshute."

Hansen said the ultimate solution to the problem lies in membership of a Soviet airline in IATA. He expressed the hope that it would happen in the coming year and make IATA a truly universal organization.

Western Reacts to Moscow?

Soviet airlines are currently seeking pressure for operating rights in the Soviet Union. European operators would like to link Moscow and other Russian cities with their European systems, and the long-haul operators want to fly to and over the Soviet Union in order to shorten their routes to the Far East.

The IATA traffic conference reported in the delegates on the fare increases announced after the Moscow conference this month. The rates factor was a series of amounts of up to 10% in first class fares on most world routes.

The report said that the increases are designed to cover increased costs of providing added luxury services demanded by first-class passengers. These added services include such items as Stenoport seats, which will probably become standard for first-class service under the new fares.

Short-term agreements were reached on other route lines, but long-term solutions were left to next year's traffic conference because of the present fluid state of police operations.

The international airlines failed to reach any conclusions on the co-allow problem, which is also involved by U.S. domestic airlines. Member airlines are making studies in their areas to arrive at a basis for specific action next year.

The IATA executive committee reported that recommendations made to the Facilitators Division of the International Civil Aviation Organization should be adopted and implemented by the two governments.

The recommendations included elimination of the passenger transfer, more regulations on airline operations, coordination to keep better and coordinate to help counterbalance operation,



516 HANS ROBBINS, Central African Airways Chairman (left, seated), and Peter Winkler, Central African's general manager, and IATA. Daily published by Aviation Week. At right, IATA members in session.



FIVE OF THE MEN who drafted IATA's original Articles of Association. L. to R.: Dr. Henry Gomik, IATA Treasurer, Prof. John C. Cooper, IATA legal advisor, Maj. J. Ronald McGrath, ROAC, Ross Brand, Air France, and Prof. A. Norris, SAS.



WALK BY HANS (second from left), the French President and visiting IATA President, welcome incoming president Juan V. Trippe. Pan American Airways' head at left, Ross Riley, CAB Chairman, right, Sir Willem Hahn, IATA Director General.



JEROME LUBNER (left) presents Flight Safety Foundation Award to IATA. Tachon, oil Director Bruckner Kreyerfeldt.

IATA At The Waldorf



This small plant helps build the world's mightiest bomber

Sounds impossible? It's a fact. The small, neat plant is a big and important job in providing national security. It is Plastek, Incorporated, which produces thousands of pounds of laminated plastic for the Boeing B-52, one of the world's greatest jet bombers. The Fresno, California, factory employs 125 workers, making it a small business by definition of the Federal Government.

But this plant could as well be a coal and iron mine in Indiana—a small and highly specialized manufacturer of aircraft equipment in Arkansas—a laboratory of three rural yards in California. It could be any one of about 3,500 small businesses, each employing fewer than

500 workers, which are subcontractors and suppliers for the B-52. There are also nearly 4,500 large firms supplying everything from rivets to complete sub-assemblies for this "long rifle" of the Air Force.

Many of the small suppliers and contractors for the B-52 also furnish parts and assemblies for other Boeing plants, the B-47 jet-sustainer bomber, the KC-97 aerial tanker, and the forthcoming KC-135 jet tanker transport. But there are many additional suppliers, too, for these planes. Again, roughly three-quarters of them are small businesses.

This network of suppliers—small and large—skilled in intricate work, provides Boeing and the nation, an unique flexi-

bility in underlining new projects, and for quick expansion in the event of a national emergency. In addition, other manufacturers supply equipment for the B-52 and other Boeing airplanes under separate Government contracts: engines, wheels, metal, upholstery, wire work, and so on. In many cases these manufacturers subcontract and supply throughout the land.

B-52s are now being delivered to Strategic Air Command. As one of the most powerful protectors of our country's security, it is true that the B-52 should be a nation-wide project. Small, medium and large businesses in 35 of our 48 states help produce it.

BOEING



Lockheed T-49A

Art's conception shows and wind tunnel model show side wing length and high aspect ratio that have helped boost the speed of Lockheed's newest and fastest piston-powered Super Constellation—the T-49A—in over the 600 mph mark (AW Oct. 18, p. 35). The new, thrust wing is 27 ft longer (30 ft from tip to tip) than any of its predecessors. Another change is in the engine placement; they have been placed 8 in. farther from the cabin for added interior space.

The T-49A model has completed its 1,000 hr. in the wind tunnel, going through close-tolerance checks at speeds up to 370 mph. To gauge any interference between engine components, the fuselage, nacelles, propellers, flap were added one-by-one in the testing.

Lockheed already has received orders from Tuscon World Airport and Air Force for a total of 100 to 150 T-49As.

Amplification of passenger discounts and more attention to facilitation needs in planning new terminals.

The executive committee announced that John Starn, of the consulting firm of Cavallaro & Calipelli, will make a survey of the traffic conference machinery. The traffic conference shall be replaced at the present time by delegates at the meetings and asked for more relief.

Enforcement Office personnel has been doubled in an effort to make the



arrival of the office as well as wide as possible. Consideration is being given to the appointment of a permanent chairman in order to give the railroad operators more continuity and legal defense.

The executive committee told the convention that an IATA private agency will be established under the leadership of M. H. Van Pelt, formerly of KLM/Royal Dutch Airlines. This agency will handle the increasing problems arising out of diversion of revenue

from interline traffic between the airlines.

New IATA Members

IATA admitted three new members in the past year—Lufthansa, the German airline; Middle East Airlines and New York Airlines, the first all-foreigner operator to join the organization. Scandinavian and Western Airlines will become a member in 1958 as it shifts its headquarters and scheduled cargo operations across the Atlantic.

WHAT DO YOU KNOW ABOUT AVIATION...

Who Navigated the First Commercial Flight Across the Atlantic?



Expenditure (pence) shown before the annual take-off is 10 pence.
Others are white, Maroon and Green.

Twenty-five years ago, those men boarded a Lark 28 in Dulak, West Africa. Hours later they were in Rio De Janeiro with their cargo of mail. The first commercial flight across the Atlantic had been completed! Four years later the navigator of the flight made the first regular crossing with the "Rainbow." His name is Ivan Dulev.

Today, Captain Debry will fly the Atlantic on the controls of a Super "G" Constellation. As one of the leading pilots of Air France, with a remarkable record of 20 years of flying the Atlantic, he typifies the men who have made it possible for Air France to serve the peoples of 28 countries for over 35 years.



Capitol Delay
at the cost of
an Air France
Executive Committee



AIR FRANCE

资料来源:根据作者调查整理。

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Nonsked Fights CAB

North American Aflencia has petitioned the U.S. Court of Appeals for the District of Columbia to make a judicial review of Civil Accounting Board's decision on New York Chicago service case and declare it "unlawful."

The Board turned down applications of North American in the case, but granted new route awards to Capital Airlines, Eastern Air Lines, Northwest Airlines, Trans World Airlines, and United Air Lines, to become effective Oct. 31.

North America's position declined that C&B's conduct was "adversely and negatively contributed to state of diversion, unsupported by substantial evidence and unsupported by relevant factors."

More VOR Stations

The Civil Aeronautics Administration has announced that 23 additional overseas navigation aids will be installed in Europe and Asia, supplementing the 49 VORs already installed or programmed. The VOR installations are being financed by the International Cooperative Administration and by counterpart funds provided by the nations involved. Eleven of the new VORs will be installed in India: four in Pondicherry, three in Coimbatore, two in Tutuk, and one in Chennai.

UK Exports by Air

The British American Trade Center reports that produce and manufactured items exported by us to the United Kingdom in 1954 were valued at \$19,480,000 and represented 21% of total us total exports. An exports into Britain during the year totaled \$119,000,000, or 13% of the total. Principal items reported by us are: silver, platinum and jewelry (\$28,400,000 worth); leather and furs (\$8,100,000) and scientific instruments, photographic and optical goods, watches and clocks (\$12,990,000).

Idlewild Expands

Construction of the International Aerial Building and two adjacent hangar-like Wing Buildings for the Solomon Islands' (Tyrone) Co. development at New York International Airport is scheduled to begin sometime this week. A \$697,162 contract was awarded last week to a New York City firm (Warrmann & Sons, Inc.) for the framing of the buildings' foundations. The Aerial Building will house federal projects, such as customs and public health, and is scheduled for occupancy in 1957.

OPERATIONS ENGINEERS

Concurrent with the establishment of a Military Relations Department at the Fairchild Aircraft Division, an Operations Engineering organization has been established. The purpose of this new group is to provide technical information for use by Fairchild Military Relations representatives, as well as by personnel at Fairchild's engineering departments. This new group will conduct studies on specific Fairchild airplanes, as well as aerospace studies relating to possible future Fairchild developments.

The scope of this organization is such that additional engineers are required in the following fields:

Aircraft Utilization
Airborne Electronics
Climatology
Economics
Military Operations
Operations Research
Propulsion

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C-54 to the Rescue

The last of a scheduled 56 C-54s in recent phases (above) was delivered to the Air Force under this month's Contract Fort Worth Division. The conversion of a converted C-54 into a C-54 provides the maintenance of basic type facilities in the case of the backlog and in certain cases for special requirements. Additional, various down and repair equipment also have been added to the inventory.

Lufthansa Plans Route Expansion Middle East, South America

Route expansion plans aimed at increasing a large part of the global network of passenger and cargo routes in World War II were announced by Lufthansa German Airlines last week. The airline will expand Middle East and South American routes and incorporate additional North American territories during 1955.

Flights to Tokyo will begin next summer with an extension planned later to an as yet undesignated Far Eastern airport. By fall, Lufthansa will again be between Hamburg and Buenos Aires via Rio de Janeiro. Lufthansa first received Far Eastern and South American routes in 1926.

Service to Moscow and Chicago from Hamburg is scheduled to start this spring.

The expansion plans were announced in Lufthansa President H. M. Bock's, who also discussed names that Lufthansa was about to replace its American pilots and other U.S. crew members with German personnel. "These decisions," he said, "are going to be done with as few linguistic, or cultural barriers."

U. S. flight captains on loan from Trans World Airlines are piloting the airline's transports with German co-pilots. Lufthansa announced that it actually plans to double its number of American pilots before the leave schedule of next summer. Navigators are on loan from Trans-Ocean Airlines.

Recently, Lufthansa announced that its capital would be raised from \$5 million to approximately \$85.4 million through a new stock offering. Bock, however, said that the West German government was the majority stock-

holder and that only scarcely less private capital shares its ownership in seven.

"The trouble with attracting European capital is that this want immediate returns in their investments," he said. "Lufthansa is a long range proposition."

A step toward implementation of Lufthansa's route expansion, was the signing this month of an air agreement with France to permit exchanges. In addition to traffic routes to cities in France, Lufthansa has French permits now to fly via Paris to points in South America, Africa, South America, the Caribbean, and Ireland in New York. France is offering non-stop via Lisbon, Geneva cities in Southeastern Europe, the Middle East, the Far East and Australia.

Northwest to Begin New York-Chicago Run

Northwest Coast Airlines last week announced plans to inaugurate direct service between New York and Chicago beginning Sunday with ten daily flights—five each way and six nonstop.

With the start of the service, Northwest will offer transcontinental one stop service across the northern tier of states.

First-class fares between the two points will be \$75.16 one way, \$17.70 roundtrip, both plus federal tax. Coach fares will be \$11 and \$6.

Three of the outboard flights and four of the westbound will be operated on a first-class basis, using Boeing Stratojets. Douglas DC-4s will be used on the tourist flights.

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USAF Is Challenged On MATS Policy

At Force is charged with "measurable absence" of coordination in procurement in a report by the Senate Subcommittee on Governmental Administration.

The criticism is based on investigation of a single case: the procurement of seats for transport aircraft of Military Air Transport Service.

MATS wanted to switch from military-type seats to more comfortable commercial-type seats. When using replacement seats were needed for four C-119 aircraft, MATS asked on several occasions to switch single seats to several type seats. "No authority whatsoever" for switching procurement for this type seat," the subcommittee report declared.

However, it was pointed out that "MATS was clearly encouraged to believe that it would receive authority to install new passenger seats by analogy to changes in seats from USAF headquarters." The authorities were in accordance from Brig. Gen. John H. Shaw, Director, Materiel Engineering, Deputy Chief of Staff for Materiel, and from Brig. Gen. George F. Price, Director of Requirements, Deputy Chief of Staff for Development.

After MATS and manufacturers "had expended much time and money in the preparation and testing of sample passenger seats," manufacturers were given by Brig. Gen. B. C. Keller, Deputy Director of Research and Development, Deputy Chief of Staff for Development, that there was no authority to change from military-type seats.

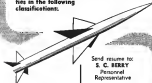
"This procurement should not have been set in motion prior to a positive and specific determination that a deviation from existing specifications was permissible," the report declared. "It is evident that there existed a lack of proper planning, coordination, and clear channel communication between MATS headquarters and USAF headquarters." It would also appear that an measurable absence of coordination existed between the Office of Requirements and the Office of Research and Development. "The subcommittee charged the Secretary of the Air Force to investigate and report to us to what extent it is being taken to ensure procurement coordination within USAF."

Observing that "such business men who negotiate with the defense forces often have to be filled with a sense of futility in attempting to obtain firm agreements with the various branches of government (which) upon long, costly procurement processes," the subcommittee added that complaints it has received "would seem to indicate that this lack of a subcommittee has not

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Jet Transport Race Gets Hotter

It is certainly no coincidence that the 11th annual general meeting of the International Air Transport Association in New York last week produced the biggest hostile over commercial airline equipment orders since the end of World War II. Never before has the problem of buying the proper type of new transports at the proper time loomed as such a critical problem for airline management. Never before has the international competition between airlines and engine makers for airline business been hotter. For, as Peter Mansfield, who is leaving the airline management field to sell gas turbine transports, recently told the Institute of Aeronautical Sciences in Seattle, the nation's sales game will be played for stakes that could easily total \$9 billion during the next decade.

PenAm's Gamble

Ignoring for the moment the domestic picture, Pan American World Airways' recent \$269 million order for Boeing 707s and Douglas DC-8s puts the jet transport race on the lucrative North Atlantic route into sharp focus. It now appears that the first halfway commercial airlines that will link the United States with Europe consist of less than seven lines will be built in Seattle and flown by an American flag line. For our British competitors who have been proclaiming that leadership in commercial jet transports for many years, this will be another in a series of disappointments now plaguing their airline industry.

The Boeing 707 jet transport will go into transatlantic service during 1959, making the nonstop New York to London run in 6 hr 45 min. Weathered it will be able to make the trip nonstop in normal summer weather but may have to stop for fuel at Gander spent the strong westerly winds of winter.

The de Havilland Comet IV, due for British Overseas Airways Corp. service in the same year, could conceivably be used on the North Atlantic, although BOAC's current plan shows the Comet to Europe routes to the Orient and Africa. On the North Atlantic, the Comet IV would be a one-stop transport, enroute with two fuel stops possibly required when backing winter winds on the westerward run.

True Measure

Combination of its limited range, limited passenger capacity—38 seats compared to a maximum of 125 for the 707—and a 30 mph down cruising speed indicate that the Comet IV will not be as effective transatlantic competitor to either the Boeing transport or the Douglas DC-8 now scheduled for Atlantic service during 1960.

During the IATA meeting we listened to Frederick

B. Rentschler, chairman of United Aircraft Corp., advance the thesis that performance of a nation in commercial air transport is a more accurate measurement of its aircraft industry than are claims made for its military prowess. Mr. Rentschler reasons that governments can and frequently do cloak the true nature of their military strength—either to conceal their own deficiencies or to propagandize potential enemies. From our own experience, we know that to be a fact.

On the other hand there is no way the facts on commercial aviation can be concealed from public appraisal. The public rides the airlines. It reads the airline's airline bulletins. The public knows if the transports actually do fly, knows their scheduled schedules and knows when equipment is sitting idly in a hangar when efficient operation or a waiting a delay that often must be caused by national subsidy.

Thus, although commercial aircraft performance certainly lags several years behind military advancement, it is accurately based on the foundation of reality development, and it actually provides an excellent yardstick with which to measure the international aerospace race, because the facts are plainly visible to all to see.

U.S. Leadership

Looking back on the history of the last transatlantic run, it is interesting to note that pre-war United States airlines and engine manufacturers, headed with Pan American Airways, were ready to fit the route several years before their international competitors. Operation on the route was delayed several years by political roadblocks designed to give European technology time to pull ahead.

During the post-war years, once transport operating regularly across the North Atlantic had an American airline, and only a handful failed to use American engines. This is a position of unchallenged leadership of which American manufacturers can well be proud. It also has provided them with the necessary technical experience and understanding of commercial aviation's problems to overcome what was once a five-year British lead in gas turbine powered transports. There is little doubt now that American manufactured transports will continue their dominance of the North Atlantic route and other key international long range routes in the jet age of air transport that will begin in 1959. During the next 30 days, the manufacturers of other major airlines facing Pan American's competition in the North Atlantic route will have to make their decisions on jet transport orders or risk major humiliations. We predict time will be a lonely crusade this fall to secure firm places on the jet transport production lines at Boeing in Seattle and Douglas in Santa Monica.

—Robert Hutz



HELICOPTER INSTRUMENTS AND CONTROLS DEMAND SPECIAL DEVELOPMENT

they've been getting it at Sperry's Flight Research Center, MacArthur Field

- One result of the first at Sperry's flight research program is the Sikorsky S-55 you see above. This flying laboratory is completely equipped with the latest in helicopter instruments and controls. It is flown by Sperry test pilots and as new models of Sperry engineers who note and record the performance of the instruments and controls under all flying conditions.
- As a result of over 10 years' research

flight research in this field, Sperry has now perfected a new flight control system which gives precise automatic stabilization and control of helicopters even under the most exacting conditions of hovering. In addition to providing precise control, a new automatic stabilization system relieves the pilot of constant tugging manual manipulations.
- A helicopter integrated instrument system including a light director has

been developed—and also a new engine has entered.

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Sikorsky rotor heads stress ESNA

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How many different stresses are exerted on this rotor head as it controls the cyclic and collective pitch of the five main blades of the Sikorsky S56 designed to transport 26 fully equipped troops? Since it also transforms engine power into forward motion or vertical flight, the stresses add up to an interesting but complicated problem in dynamics. Notice that Sikorsky has solved the fastening problems related to this rotor head design with dozens of standard hexagon and double hexagon Elastic Stop nuts.

They are self-locking, maintain precision adjustments and

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Sikorsky Aircraft Company had been using Elastic Stop nuts for over a decade before it began developing rotary wing aircraft in 1939. They have been a steady ESNA customer for 27 years and Elastic Stop nuts have been a standard fastener on every new Sikorsky design.

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